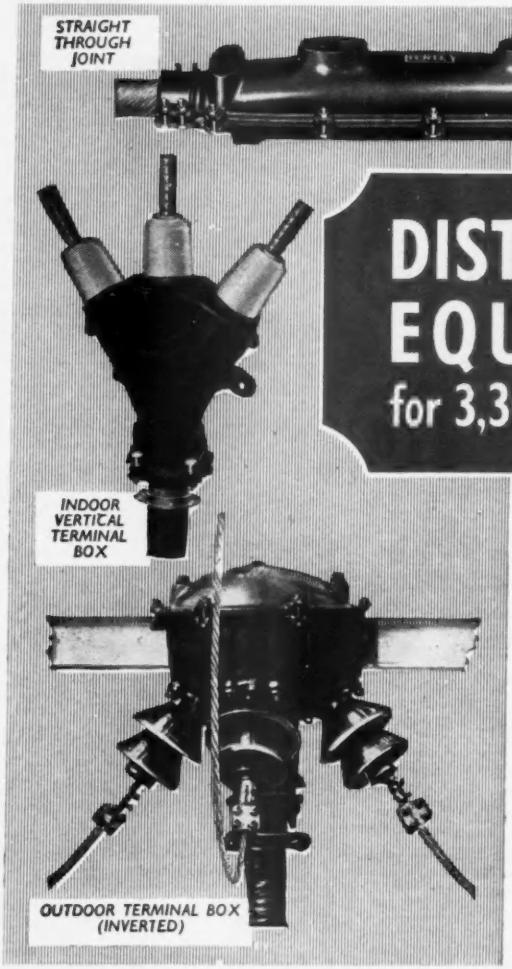
ELECTRICAL TIMES

THURSDAY
21 FEB. 1952
NINEPENCE




DISTRIBUTION EQUIPMENT
for 3,300-11,000 volts

For indoor and outdoor installations at working pressures of 3,300-11,000v. Fully described in the following HENLEY catalogues; copies free on request:

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## Self-supporting
## High Heat Micanite

**Having developed a special inorganic bond M. and I. are able to supply built-up mica, known as High Heat Micanite, which, like block mica, is self-supporting at high temperatures.**

**High Heat Micanite is specially suitable for unsupported electrical heating elements and resistances and it may be used as an alternative to block mica in many other applications.**

**With the growing requirements of the Defence Programme there are many instances where High Heat Micanite can be used instead of block mica with benefit both in respect of cost and delivery, with the added advantage that it is available in comparatively large pieces.**

### High Heat Micanite

1 Maintains its electrical properties at high temperatures.

2 Is suitable for unsupported electrical heating elements, surface heaters, all types of resistances and heating elements on voltages up to 600 where the temperature of the micanite does not exceed 500°C.

3 Is produced in thicknesses up to 0.060″: density 2.4 to 2.5. (To ensure adequate mechanical strength a minimum thickness of 0.020″ is recommended).

4 Is produced in flat pieces only (cannot be shaped or moulded.)

5 Is available in lengths up to 40″.

*As the machining of High Heat Micanite requires special facilities and experience, M. and I. prefer to supply it in pieces cut to size and ready for use.*

**THE MICANITE & INSULATORS Co. Ltd**

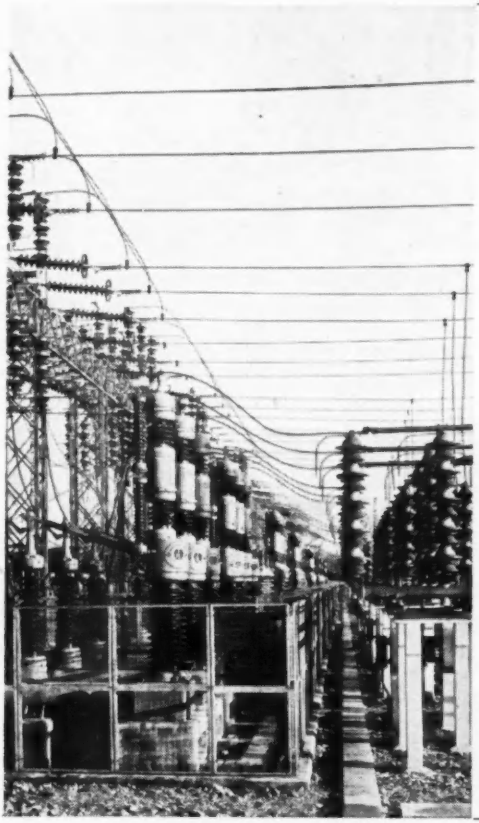
Empire Works · Blackhorse Lane — m and i — Walthamstow · London · E.17

Branch Offices at Birmingham, Cardiff, Glasgow, Manchester and Newcastle-upon-Tyne and representatives in most countries throughout the world.

Manufacturers of Micanite (Built-up Mica Insulation). Fabricated and Processed Mica. Paxolin Laminated Materials. Panilax Laminated Materials and Mouldings. Empire Varnished Insulating Cloths and Tapes. High Voltage Bushings and Terminals. Distributors of Micoflex-Duratube Sleevings, Micoflex-Durasleeve (Plastics-covered flexible metal conduit) and Kenutuf Injection Mouldings (P.V.C.)

# 'ENGLISH ELECTRIC'

## air-blast switchgear



### One of the Range

The 132 kV 2,500 MVA two interrupter circuit-breaker is one of the range of 'ENGLISH ELECTRIC' high voltage air-blast breakers using common interrupters and other standard parts. The illustration shows the Beddington sub-station of the British Electricity Authority where these are installed.

**The ENGLISH ELECTRIC Company Limited**

QUEENS HOUSE, KINGSWAY, LONDON, W.C.2

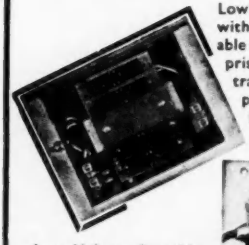
Switchgear Department, Stafford

*Works: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL*

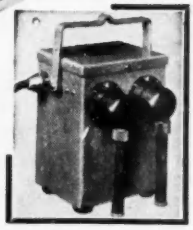
SH.3

A

LOW VOLTAGE TRANSFORMERS



Low Voltage Lighting Unit with lid removed. Suitable for M/c tools, comprising double-wound transformer with fused primary and secondary D.P. on-off switch, housed in steel case.



Low Voltage Portable Transformer suitable for hand-lamps, portable m/c tools, etc. Fitted with Reyrolle plugs and sockets and carrying handle.

We specialise in the manufacture of LOW VOLTAGE TRANSFORMERS to customers' individual requirements. Single or three-phase from 50 V.A. to 25 k.V.A.

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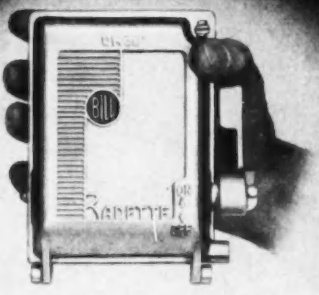
*You cannot buy better gear*



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EMINENTLY SUITABLE FOR MACHINE TOOLS
"RADETTE" Q1438.
FOR MOTORS UP TO 2 H.P.

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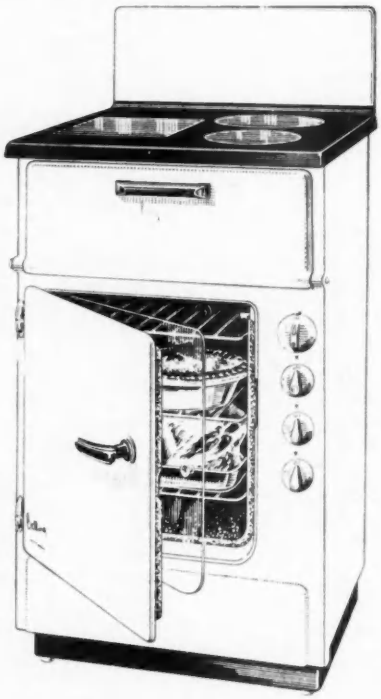
# there's a Belling for everyone



**BELLING 47 SERIES** 2 boiling plates and grill-boiler. Large warming cupboard. Large oven clear of all electrical parts, with rounded corners for easy cleaning. Automatic oven control. Black and white vitreous enamel. £29.10.0. Optional extras: utensil drawer, simmerstats, cream finish, and, of course, the inner glass oven door for visible cooking. Ask for details of other cookers in the 46-47 range from £25.0.0.

In the past you probably haven't had all the Belling cookers you asked for. But the new plant which we've installed is beginning to make a difference to production and you can now order with confidence of getting quicker delivery.

**BELLING STREAMLINE** 2 boiling plates and grill-boiler. Extra large oven clear of all electrical parts, with rounded corners for easy cleaning. Armourplate inner glass door. Interior floodlighting. Automatic heat control throughout. Big warming cupboard. Large splash plate and hob cover. £49.10.0. Available on wheels for easy cleaning.

**BABY BELLING** Biggest of the "Babies" yet one of the lowest in price. It's the best-known of all small cookers, and the easiest to sell. It has the largest oven—almost as big as many full-sized cookers. Standard E.D.A. grill-boiler. Really large warming compartment. In black and white vitreous enamel. £13.15.0. With stand £15.19.0.

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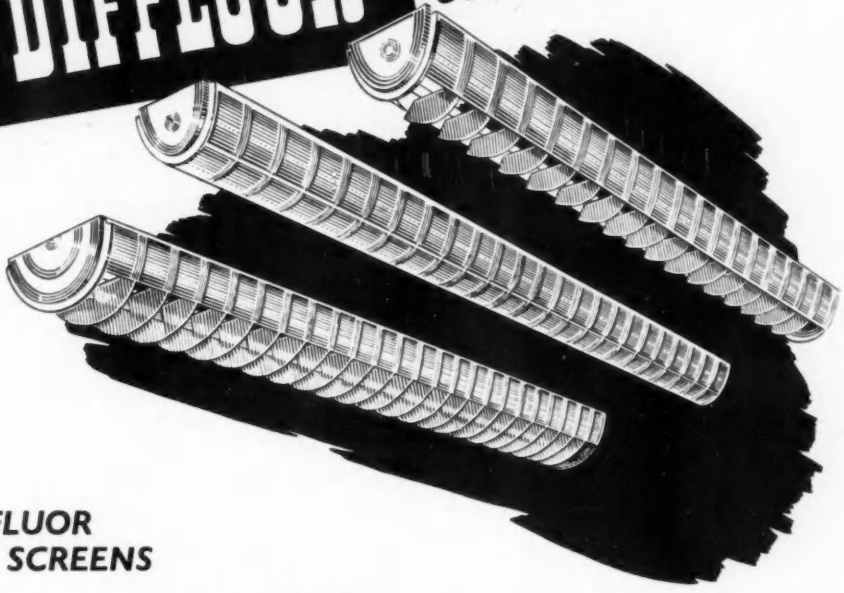
*Introducing The Lighting Sensation of Paris!*

**FRANCO DIFFLUOR**

**LIGHT-DIFFUSING SCREENS AND FITTINGS**



***DIFFLUOR SCREENS***

★ Crystal prismatic screens for all standard fluorescent lamps.

★ Addition of these screens increases floor luminosity.

★ Can be arranged to suit any architectural design.

★ Instantly attached and removed.

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*Send for details and price list to:*

*Ask also for particulars of* **PLEXILUX** *shadowless multiple tube fittings*

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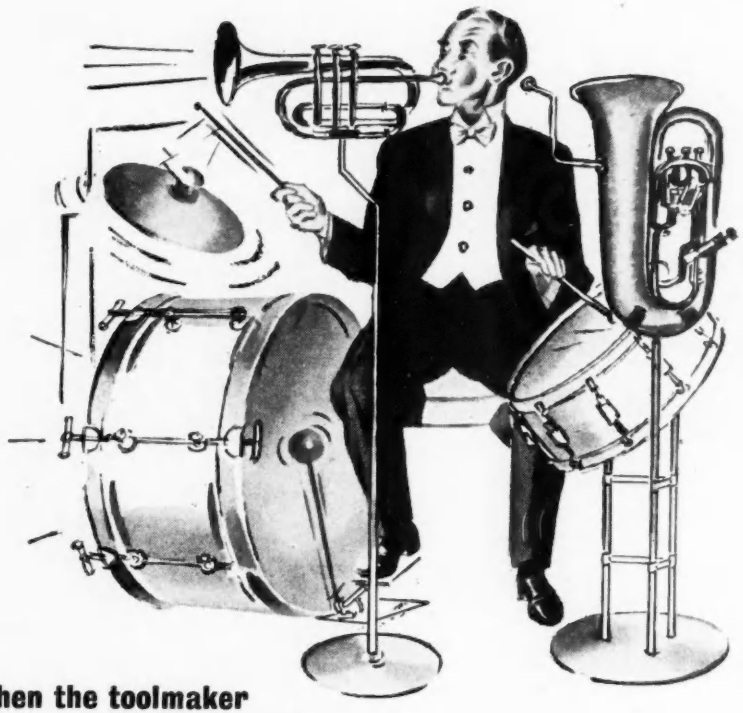
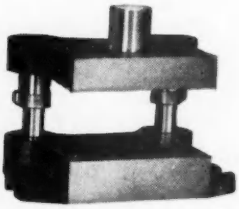


**When the toolmaker**

**makes press tool sets . . .** he becomes a one man brass band. (Which is clever enough in its own way but not — you must admit — not quite so pleasant to hear as a full scale band!) The toolmaker's job is making tools: why should he bother with Press Tool Sets? The cornet player doesn't usually yearn to thump the big drum. Really clever toolmakers know of course that it is better — and quicker and cheaper — to leave the Sets to Desoutter. Could we say that a bit louder? *Clever* toolmakers know that

it is quicker and cheaper to
order your PRESS TOOL SETS
from **Desoutter**



*Desoutter Bros. Ltd., The Hyde, Hendon, London, N.W.9. Tel: Colindale 6346 (five lines) Grams: Despnuco, Hyde, London*
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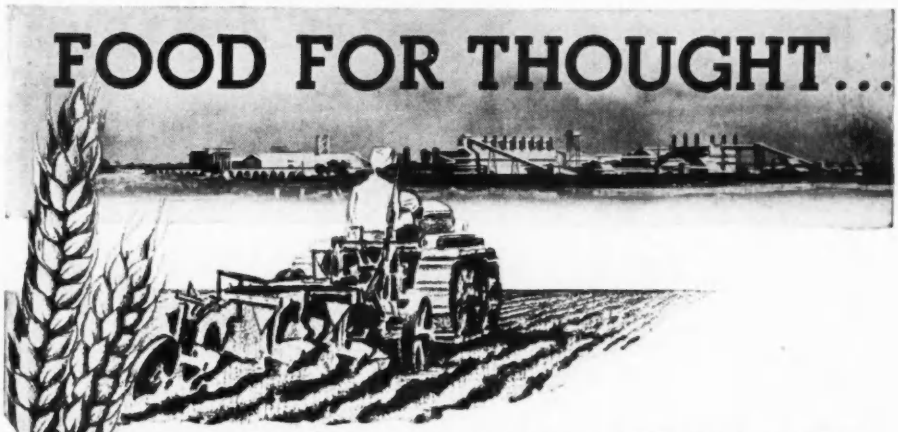
# FOOD FOR THOUGHT...



INCREASE of India's vast population by over 40 millions in the past 10 years and, in the same period, a reduction in her basic food supplies from overseas due to the ravages of war — these are the background to the establishment, by the Government of India, of its new Fertilizer Factory at Sindri.

In a plant of such primary importance it is fitting that the whole of the steam raising equipment for both power and process purposes is of BABCOCK manufacture. This equipment was supplied to the order of The Power-Gas Corporation Ltd., acting for the Government of India, and installed by Babcock & Wilcox of India Ltd. It comprises six Tri-Drum boilers each rated at 175,000 lb. steam/hr. (M.C.R.) at 650 lb. sq.in. 835° F, fired by Babcock-Detroit RotoGrate stokers, burning low-grade coal previously considered unusable for steam-raising purposes. All the coal handling plant and much of the other ancillary equipment, including the steel self-supporting chimneys, galleries, ladders, hoppers, etc., were also supplied by Babcock & Wilcox Ltd.

. . . . . Another example of the *comprehensive* service offered by the Babcock organisation all over the world.

**BABCOCK INDUSTRIAL BOILERS**

*The Sindri Fertilizer Factory, engineered by the Chemical Construction Corporation of New York, is claimed to be the largest in Asia, its present designed output being 350,000 tons of fertilizer yearly.*

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## in a Public Library—

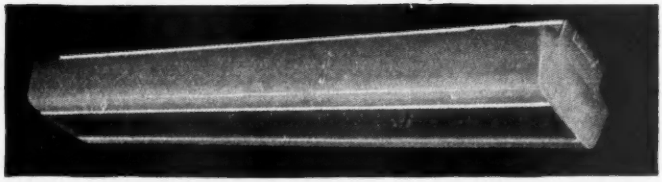
**causes LOW MORALE IN THE STAFF,**
**EYE-STRAIN IN THE READING-ROOM,**
**DISCONTENT AMONG RATEPAYERS**

IN MANY PUBLIC libraries and other municipal buildings, there is a tendency to retain old-fashioned lighting, with its harmful mixture of glare and shadow, which leads to inefficiency. The modern outlook demands fluorescent lighting by Philips, which brings to every desk and book-shelf the ideal light for the purpose. No harsh glare, no deep shadows, but clear, restful vision. Staff and public alike are grateful.

* ***The state of being cloudy***

*The smart "Arundel" fitting which contains two 40 W. 4 ft. Philips fluorescent lamps. Other suitable fittings for public buildings are "Amesbury" and "Westbury".*

PHILIPS



**Consult**

# PHILIPS ELECTRICAL LIMITED

**on all lighting problems**

LIGHT GROUP, CENTURY HOUSE, SHAFTESBURY AVENUE, LONDON, W.C.2.

MAKERS OF: RADIO & TELEVISION RECEIVERS · "PHILISHAVE" ELECTRIC DRY SHAVERS, ETC.

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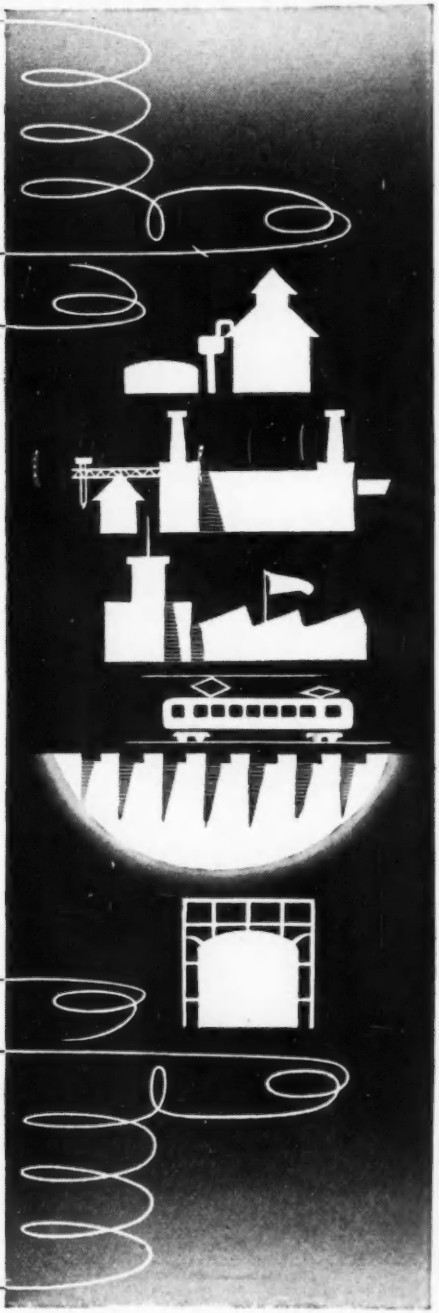
# Large supervisory staffs superseded!

# two wires now give complete control

"A.T.M." Supervisory Remote Indication and Control Equipment soon pays for itself in the manpower it saves. Facilities include: operation of circuit breakers, starting and stopping of machines, raising and lowering of voltages by transformer tap-change equipment, essential metering and indication of fault conditions, etc.

The equipment has also been successfully adapted for remote-control in gas distribution networks, oil refineries, electric railways, aerodromes and blast furnaces.



ATM

**Supervisory Remote Indication and Control Equipment**

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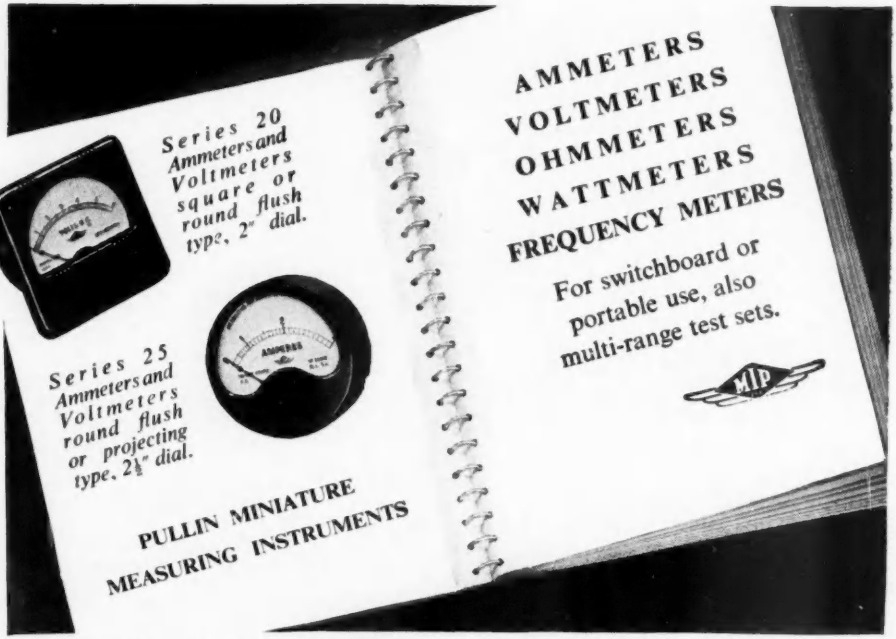
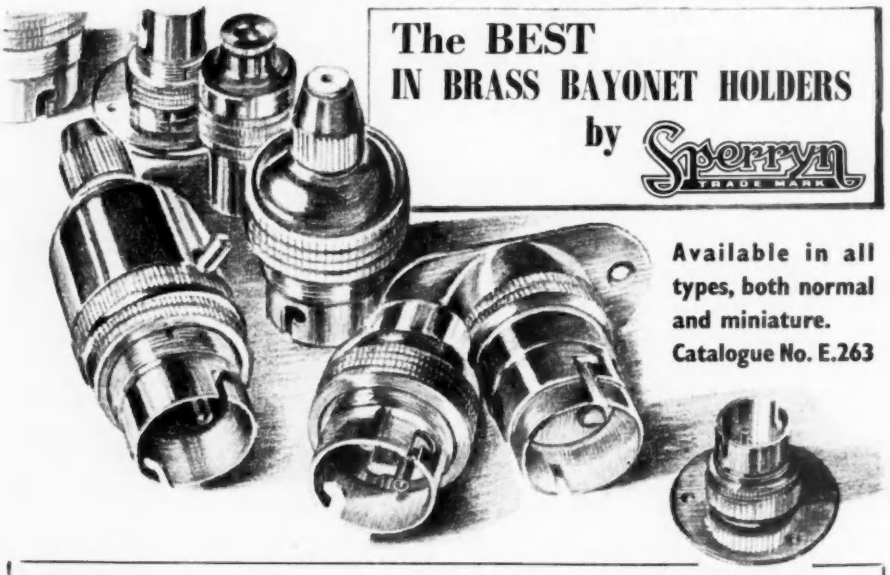



MEASURING INSTRUMENTS (PULLIN) LTD., ELECTRIN WORKS, WINCHESTER STREET, ACTON, LONDON, W.3

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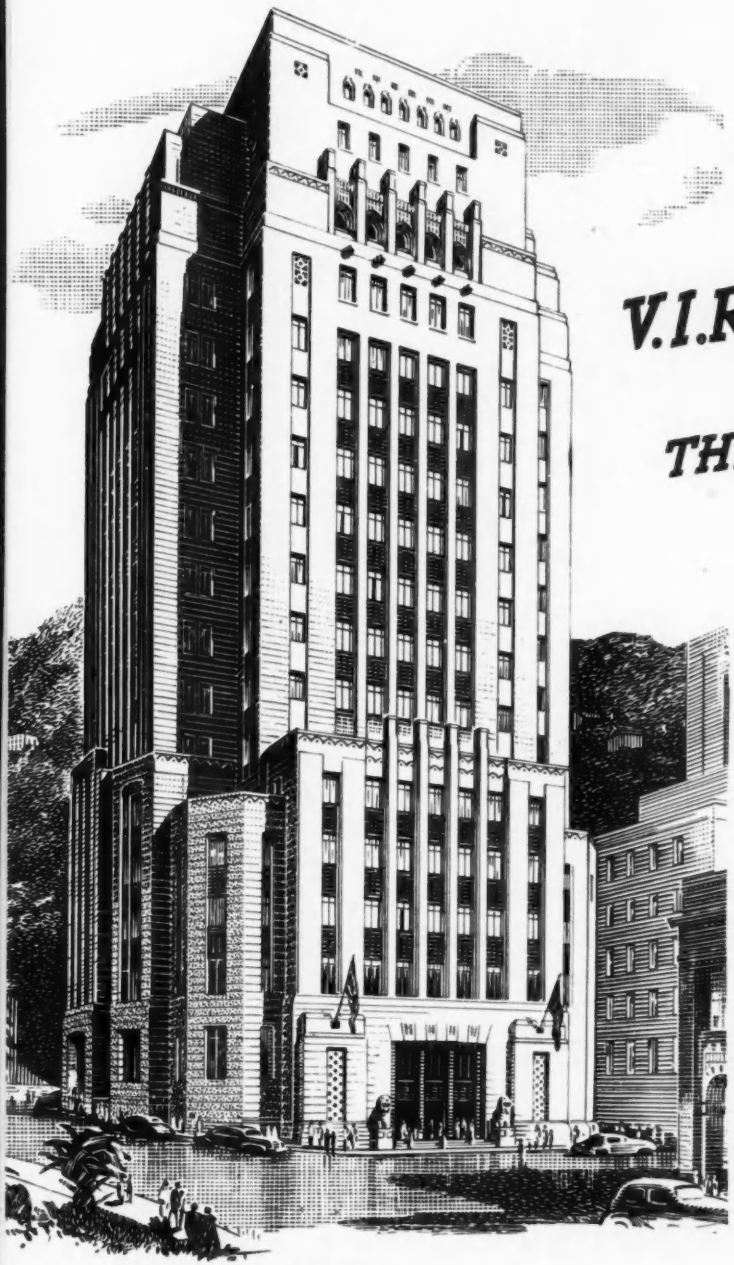

*Architects: Messrs. Palmer & Turner*

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## BANK OF CHINA HONG KONG

THIS IMPOSING NEW building erected by the Bank of China in Hong Kong is the tallest in the colony. The electrical installation was carried out by The China Engineers Ltd., using J. & P. Cables throughout.

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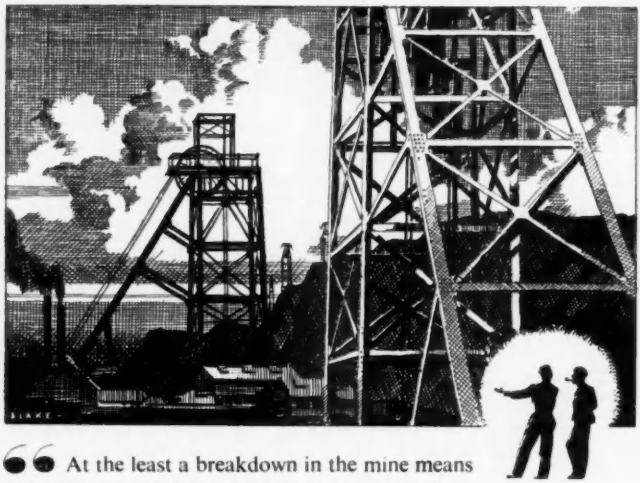
*The mark that means that "little more" in quality*



# Britannic Cables carry the load

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"At the least a breakdown in the mine means serious loss — at the worst it means danger to life. Here we take no risks with our equipment — everything is as good as it can possibly be and so — Britannic Cables carry the load."

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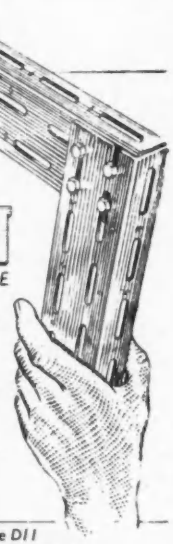

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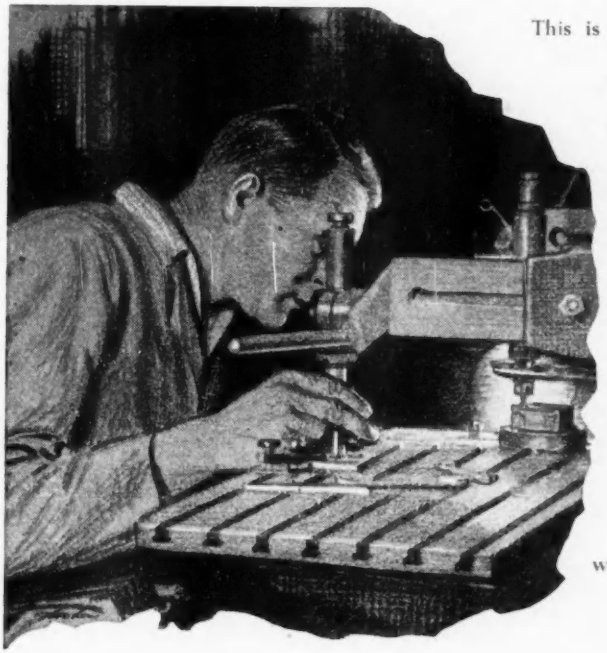

This is Craftsmanship in the modern manner. The Craftsman, fully understanding the powers and limitations of the Machine, and guiding it with a deep sense of quality.

The WYLEX Tool Room takes pride in the tools it produces. Good men work in it, and good work comes out of it. WYLEX—and its workers—"MUST BE GOOD!"

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WYLEX

GEORGE H. SCHOLES & CO. LTD., WYLEX WORKS, WYTHENSHAWE, MANCHESTER

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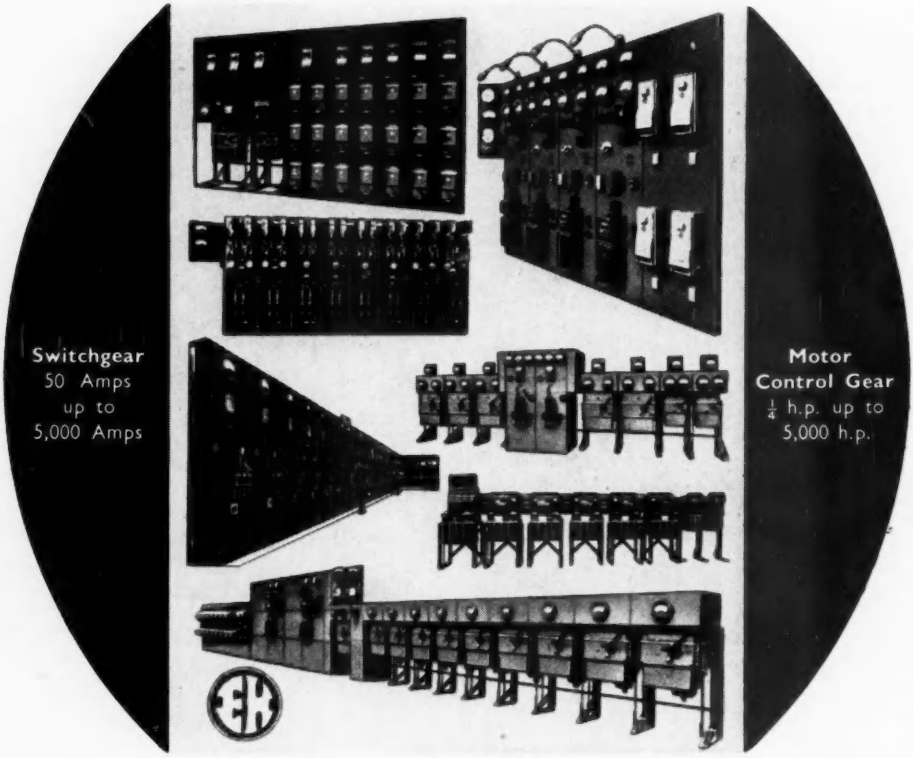
SPECIALISTS IN THE MANUFACTURE OF SWITCHGEAR SINCE 1905

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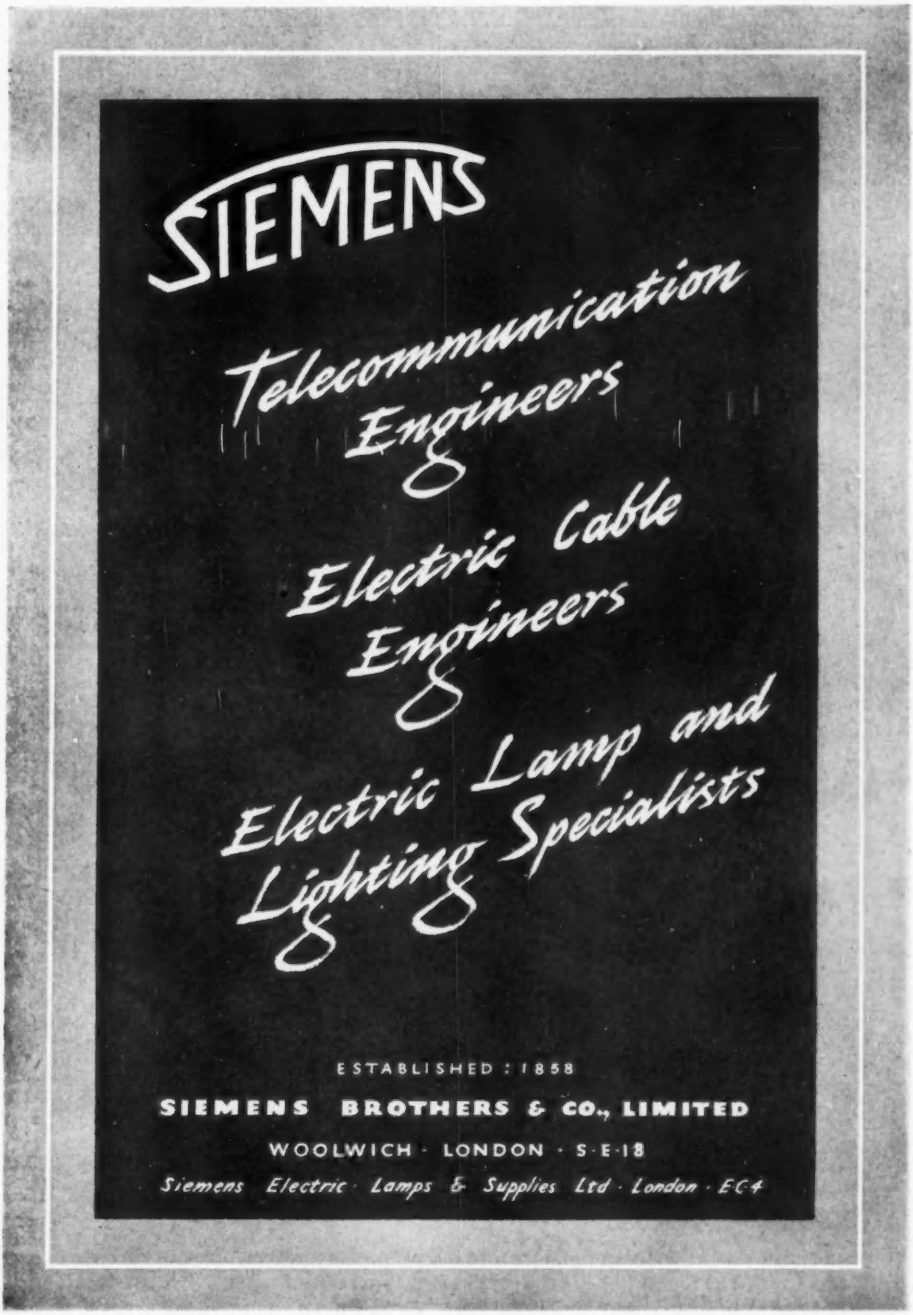
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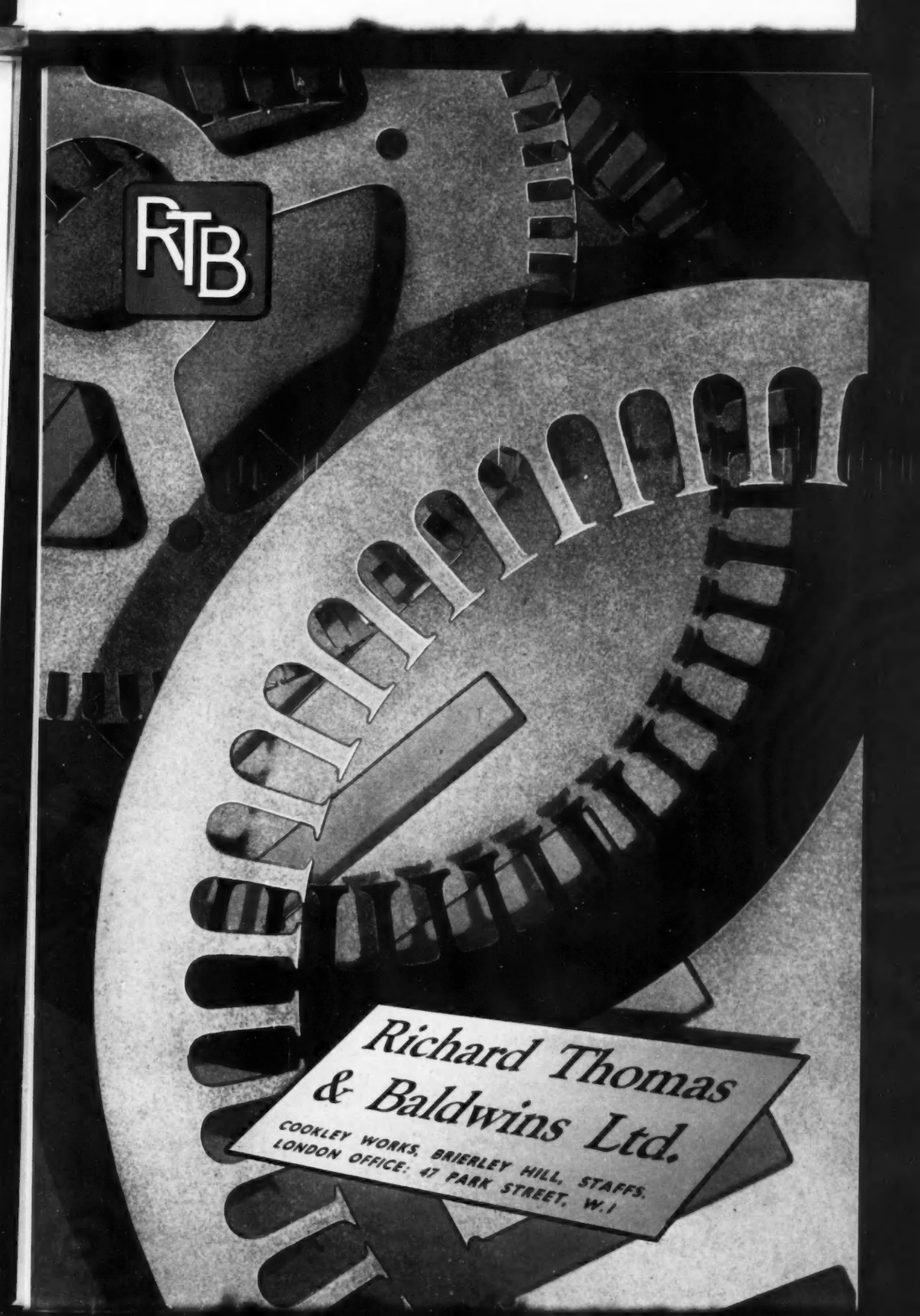
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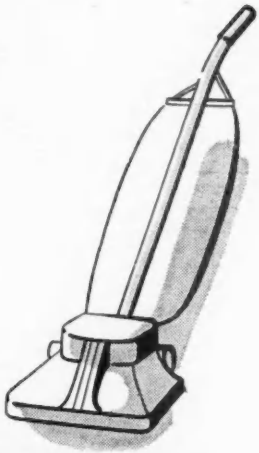
LONDON OFFICE: 47 PARK STREET, W.1

# keep it going... ... longer



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*May we send you details of the types and range of "BICALEX" Winding Wires in Publication No. 267V*

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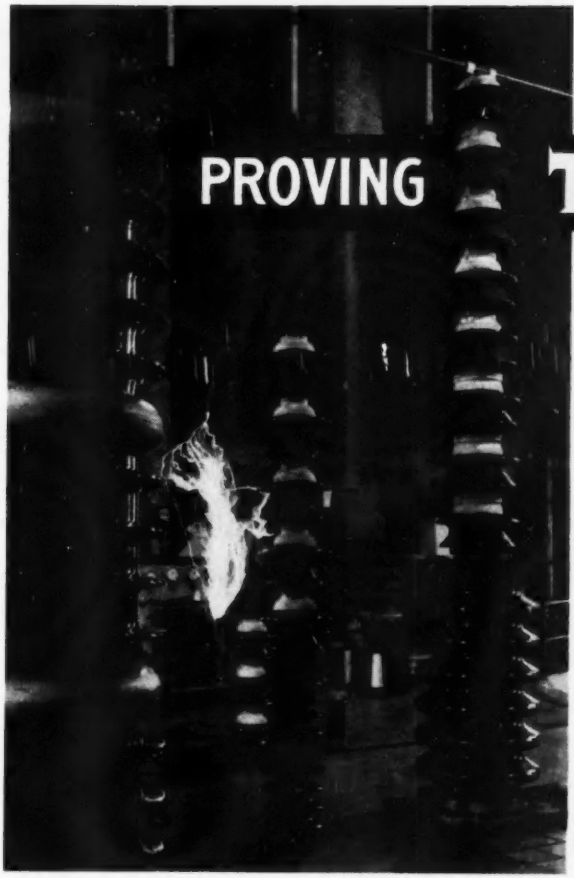
**BRITISH INSULATED CALLENDER'S CABLES LIMITED**
**NORFOLK HOUSE, NORFOLK STREET, LONDON, W.C.2**

B.I. Callender's A PRODUCT




It is this capacity for maintaining, consistently, the self-imposed high standards of the organisation that has earned for Taylor Tunnicliff the world-wide reputation of Masters of Porcelain Insulation.
This portrait of a post of heavy duty pedestal insulators flashing over at about half a million volts R.M.S. 50c/sec. illustrates one of the tests (electrical, mechanical, thermal and chemical) made every day in the high-voltage Test Laboratory at Hanley

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*London Office* 125 HIGH HOLBORN W.C.1 *Telephone : HOLborn 1951*

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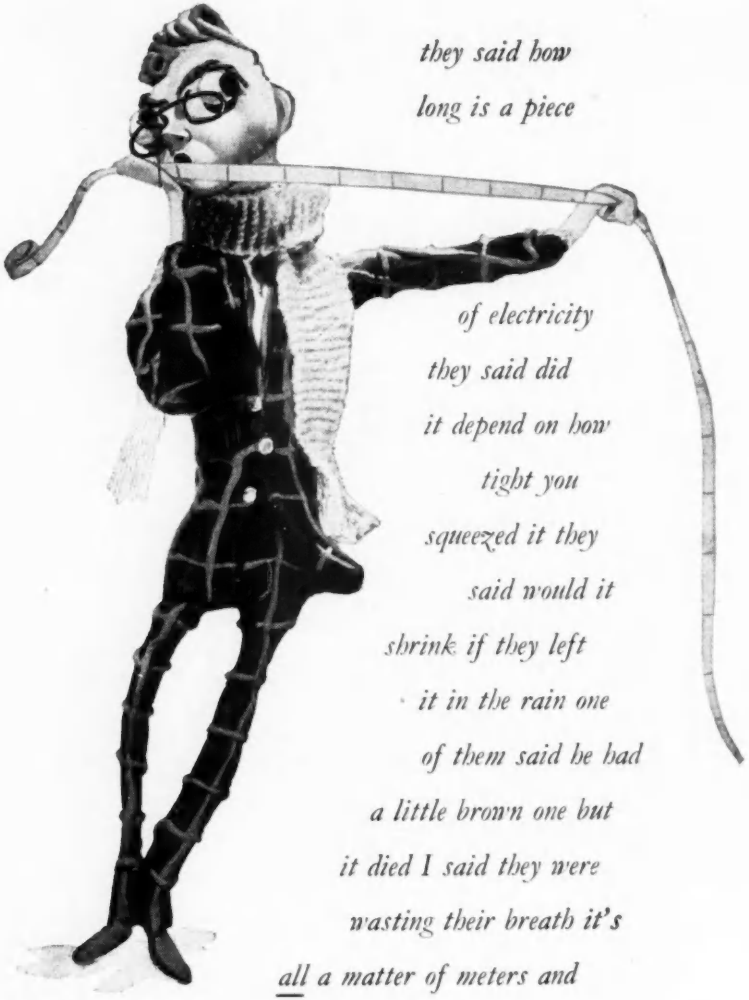


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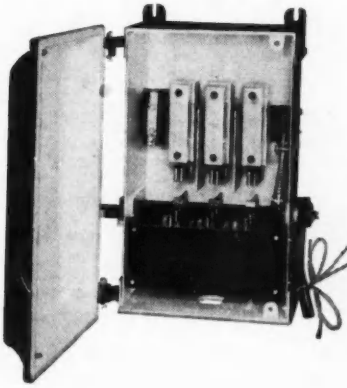

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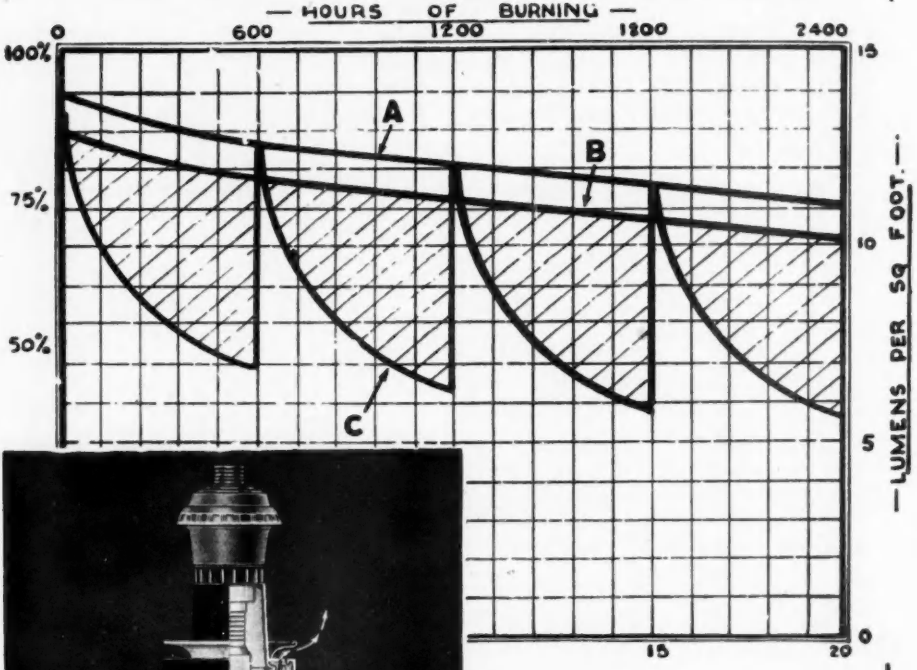


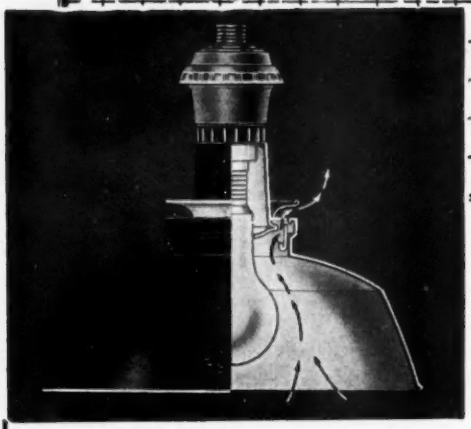

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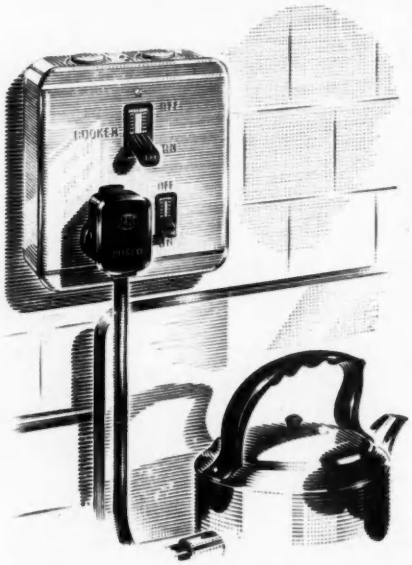


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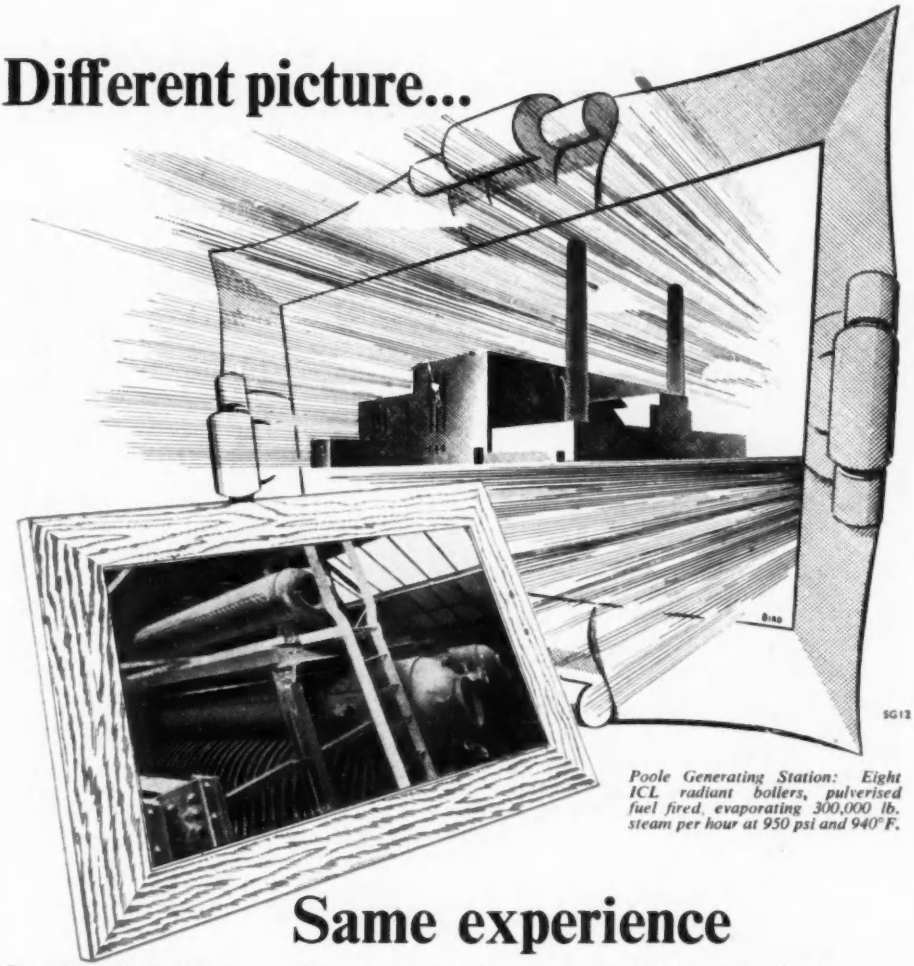
# Different picture...



*Poole Generating Station: Eight ICL radiant boilers, pulverised fuel fired, evaporating 300,000 lb. steam per hour at 950 psi and 940°F.*

*One stoker fired boiler evaporating 37,500 lb. steam per hour at 260 psi and 750°F, installed at a paper mill.*

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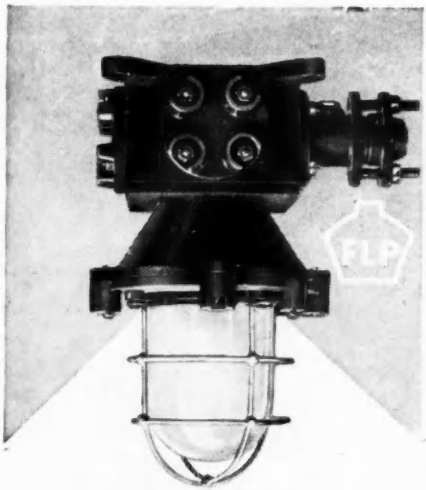


IMPROVED

DESIGN

The "Wigan" flameproof well glass fitting illustrated incorporates a new plug-in connection from the flameproof bush to the terminal block in the joint box.

The fitting is manufactured in 3 sizes, viz. 60, 100/150 and 200 watt, and has been certified by the Ministry of Fuel and Power, Safety in Mines Research and Testing Branch, Buxton.

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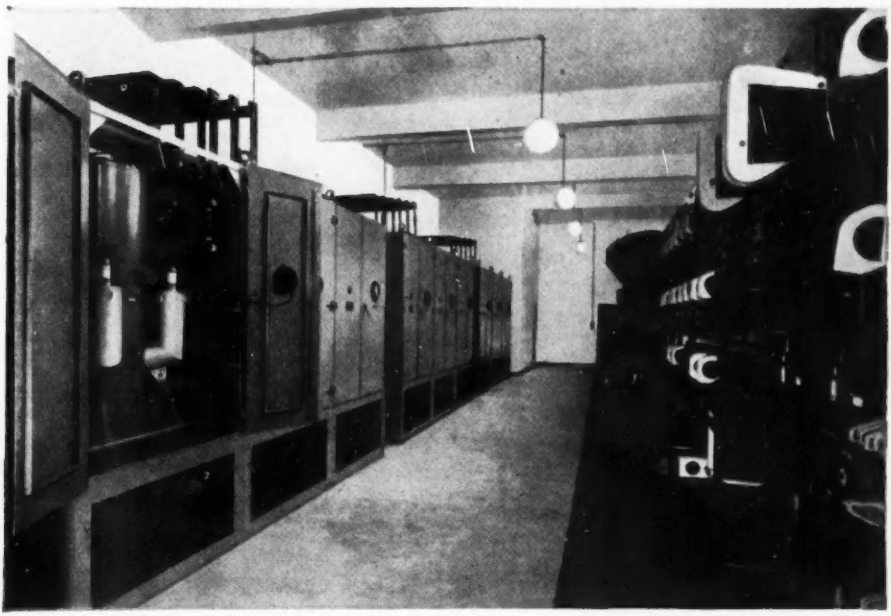
# 'ENGLISH ELECTRIC'

## mercury-arc rectifiers



### D.C. Power for Steel Works

The 'ENGLISH ELECTRIC' sealed steel tank mercury-arc rectifier, with its simplicity of operation and minimum maintenance requirements is particularly suitable for unattended sub-stations. One of its many industrial applications is in steel works for supplying D.C. power, both for main mill motors and auxiliary services. The illustration shows a sub-station containing three 1,500 kW 'ENGLISH ELECTRIC' rectifiers supplying power to the main drives of a Cross Country Mill at the Round Oak Steel Works.

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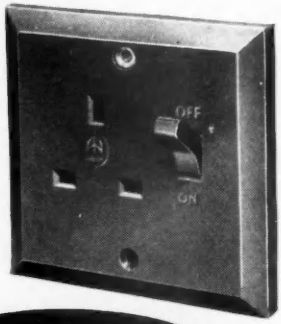


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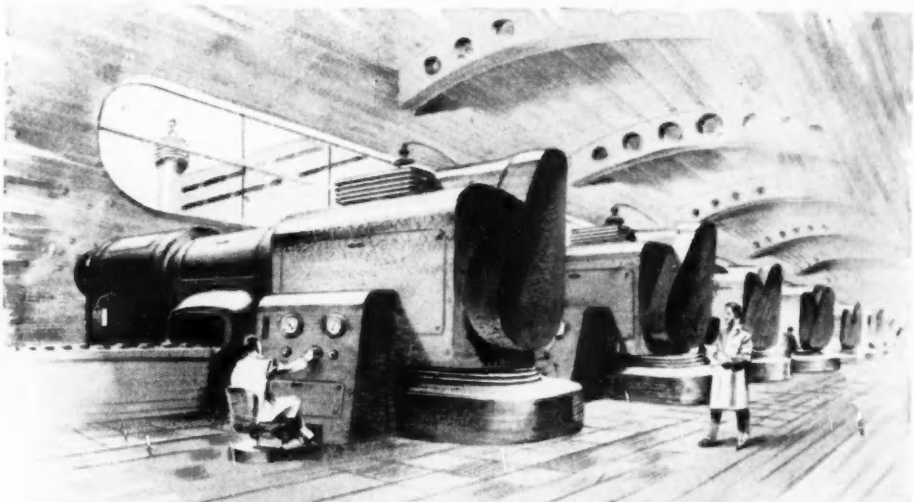

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*Rewinding a 35 h.p. 500v. D.C. motor with "Fibreglass"—base insulation for class B duty in a glass works. Photo by courtesy Pilkington Brothers Ltd.*


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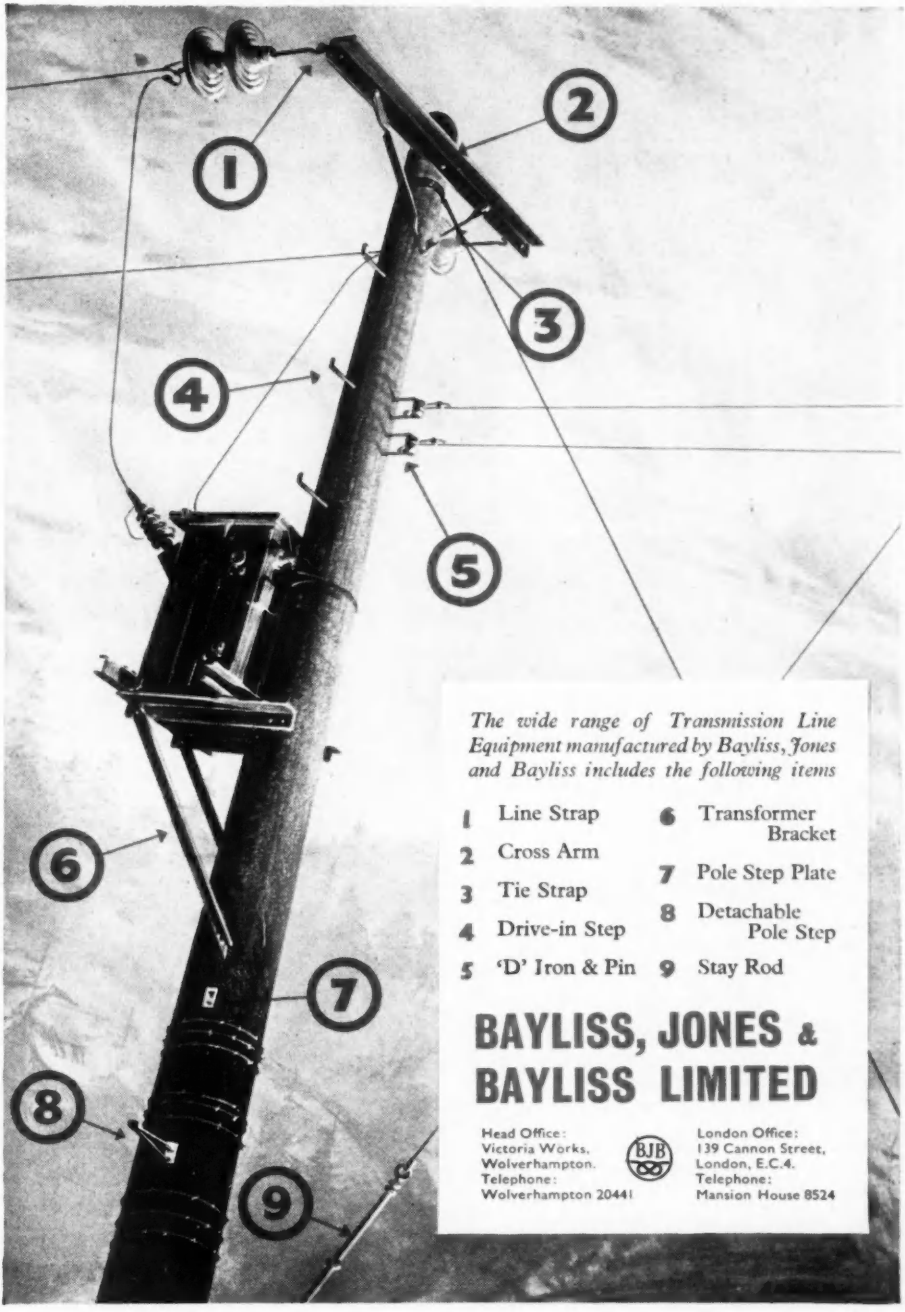


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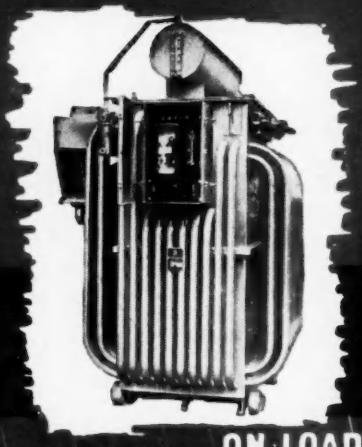

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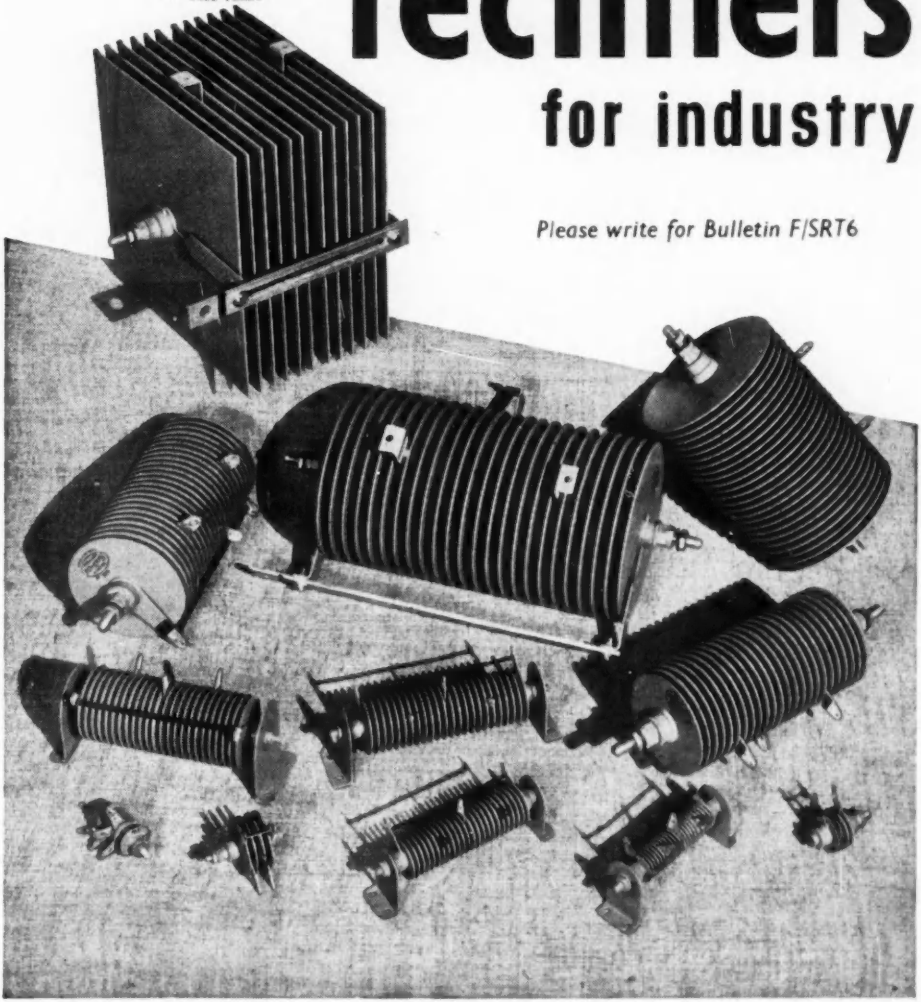

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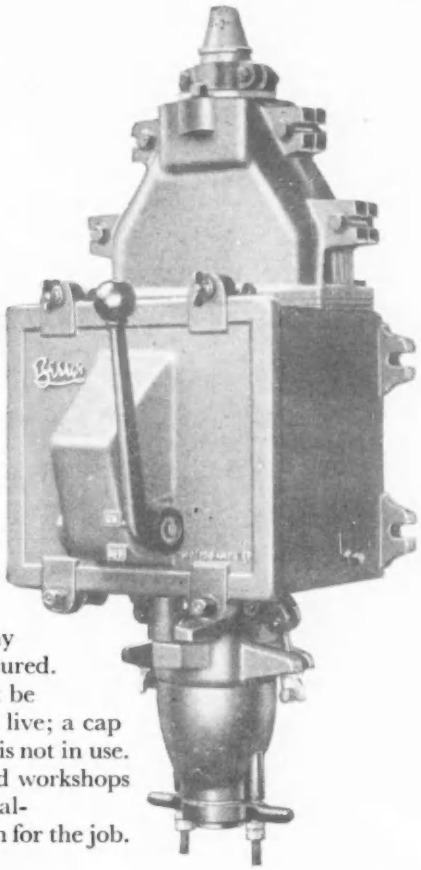

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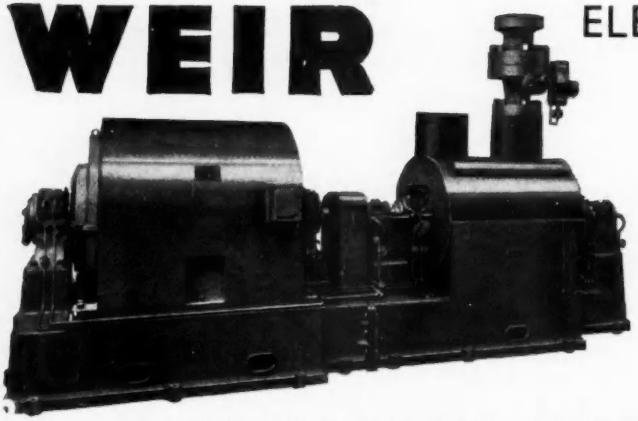

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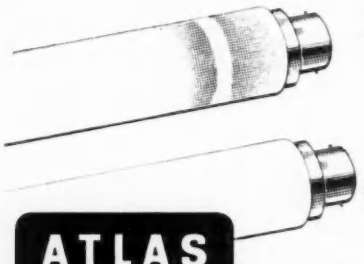

Many fluorescent lamps show "black rings" – the sign of approaching failure – after as little as 1,000 hours!

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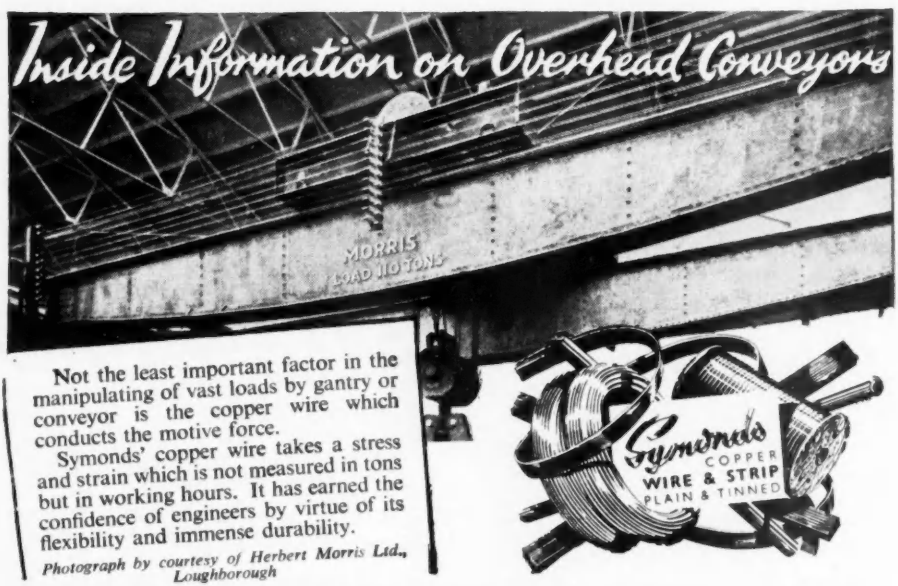


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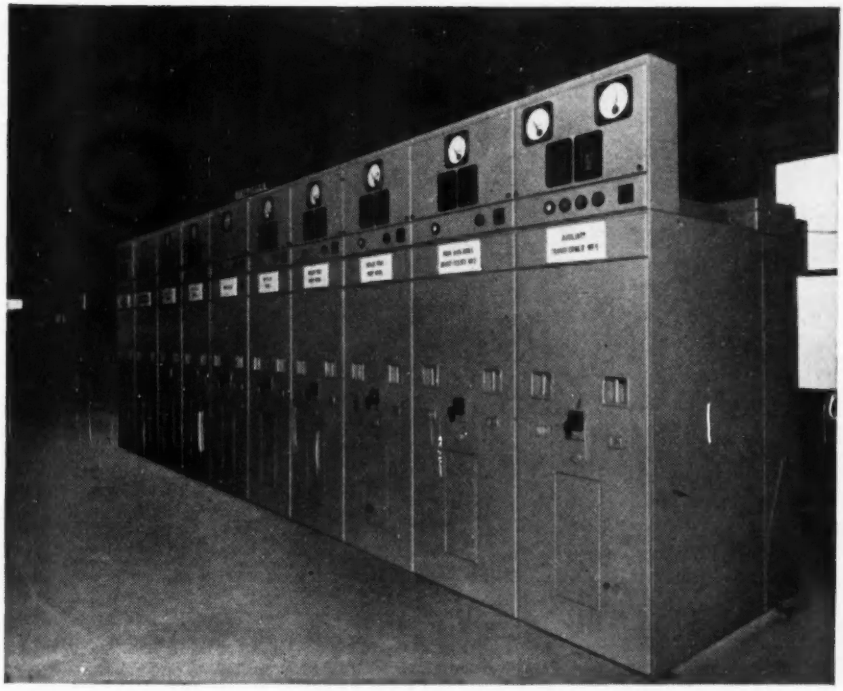
★ *If you want to talk switchgear . . . . talk to Reyrolle*



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***If you want to talk switchgear***

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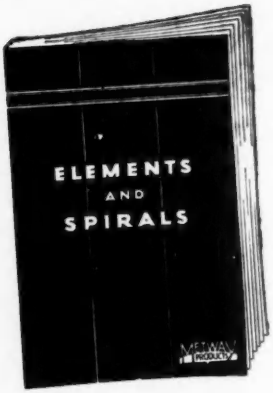


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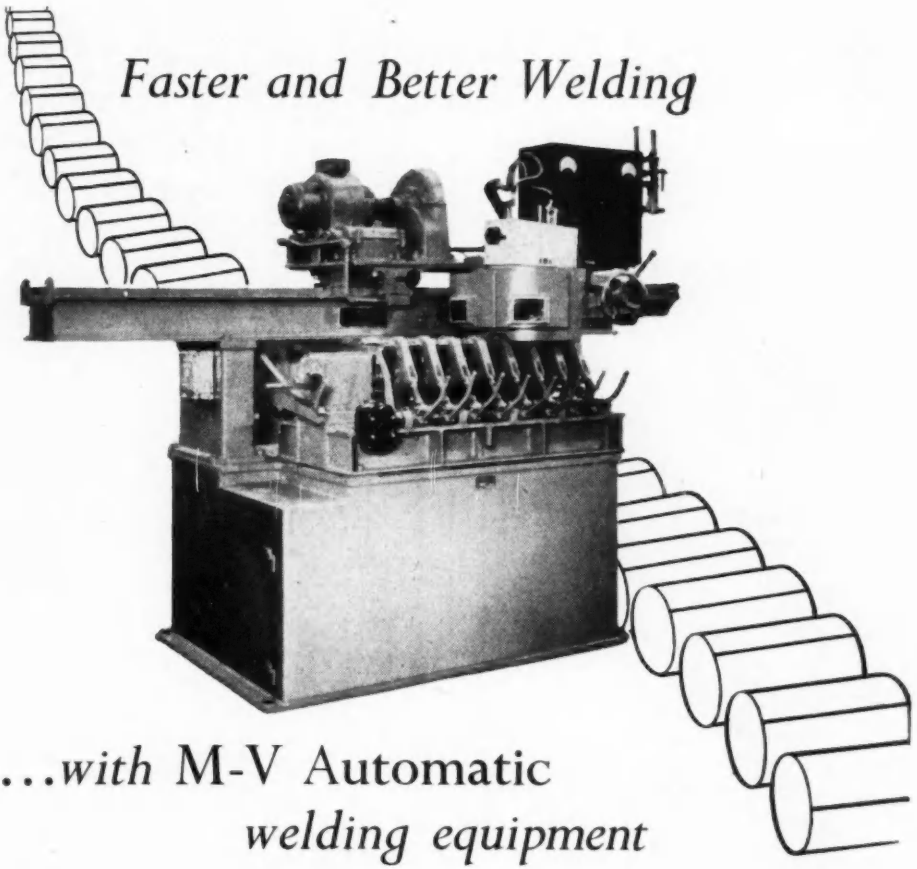

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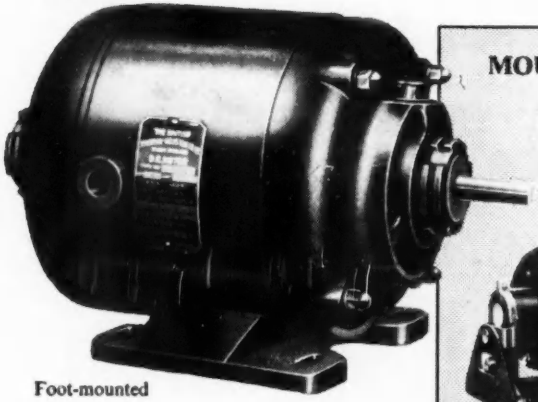
# Fractional Horsepower Motors



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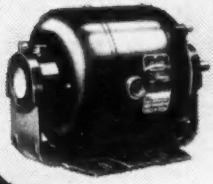

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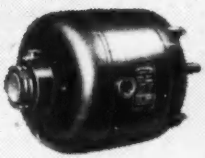
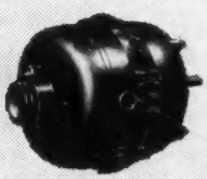


Spigot (Vertical) Spigot (Horizontal)



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ELECTRICAL TIMES

Vol. 121 No. 3146 THURSDAY, 21 FEBRUARY 1952

PUBLISHED EVERY THURSDAY

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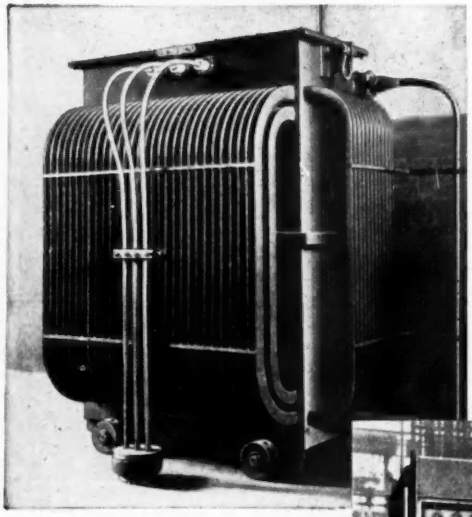

(ABOVE) One of two 1,000 kVA 11kV/400-230 volt Stepdown Transformers, at Frankley pumping Station Birmingham.

(OPPOSITE) A Mercury-arc rectifier providing a 300 amp. general load in a works Substation.

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# Editorial

## *CROWDED CONFERENCE*

SOME disappointment has been expressed at previous British Electrical Power Conventions that the time available has not been always utilised to best advantage. Details of the programme for this year's Bournemouth meeting which have now been disclosed, show ample evidence that the Convention Council has been determined to avoid again attracting such comment. A good programme has been assembled, which would admirably have filled the business sessions of a week-long meeting. Now it has been compressed into a mere two-and-a-half days under pressure of demands for economy. Fourteen lectures, papers and addresses, not to mention a brains trust, in this period cannot seem other than excessive, and the moments of "spare time" available between sessions are well filled with receptions, dinners, and the other traditional accompaniments of the Convention. Since there will be this pressure on time at Bournemouth, it is important to take care that opportunity shall be given for discussion of all the information that is being presented. At the only two sessions at which this will be possible, *Meteor* hopes that papers will be taken as read or, at any rate, summarised by a general reporter. There should be plenty of detail in the mass of papers to excite delegates into comment or question, so let the sessions be used for that. Those attending should be warned beforehand that it is assumed that they have studied the advance copies that will no doubt be available.

## *COMFORT AND COST*

SOLID fuel domestic heating appliances appear in the most attractive light when continuous heating for hours or days at a time is involved. So experiments with central heating on the North American pattern, christened for this country "whole house heating," seemed likely to give a result counting a point against the electric fire in the important debate on domestic heating that is now proceeding. The conclusions advanced in an Institute of Fuel paper, which summarises these Building Research Station investigations, come, therefore, as a pleasant surprise. Directly and indirectly they exemplify the way in which correct theoretical assumptions about heating, based on thermal efficiency considerations, can be invalidated, in terms of pounds of coal per unit of comfort, by the whims and workings of those who are to be kept warm. The paper shows that with whole house heating the expected fuel economy has not been obtained because (as Mr. Humphreys recently pointed out in stating the scientific case for electric heating) for a given comfort level a higher temperature is required with convective heating than with radiant heating such as the electric fire can provide. And these higher temperatures mean higher heat losses to the atmosphere. It is most pleasant to find such unsolicited support of this aspect of the case for the electric fire unexpectedly in this official research report.

## *EXPANSION IN U.S.A.*

SEVEN thousand megawatts of new generating plant and a total of 370,536 m. units produced with an installed generating capacity of 72,000 MW. So runs the story of the U.S. supply industry during 1951, as told in the annual survey of our American contemporary, *Electrical World*. In some respects, of course, these remarkable figures are merely a reflection of the size of the North American continent, but they none the less illuminate many truths that need to be always before those who manage electricity supply on this side of the Atlantic. First of all, they again refute the idea which is always being whispered, that saturation is upon us. The domestic consumer in America used 2,000 units in 1951 compared

with his British equivalent's 1,350, based on the most recent figures. Moreover, the American nation had 0·47 kW installed for every inhabitant, against Great Britain's 0·31 kW. Then, again, there is the associated problem of investment in the industry. With this background, and with supplies effectively available to all, the Americans plan to spend £1,120 m. this year on a programme to give 9,000 MW of new plant, together with the corresponding transmission and distribution facilities. To be compared with this is the £140 m. capital expenditure on the B.E.A.'s systems this year, the estimate advanced by the Minister of Fuel and Power, and the ultimate limit of 1,800 MW/year, to which must be added the North of Scotland Hydro Board's budgets. No ready solution presents itself, but the inadequacy of British intentions when compared with the task of climbing up to American standards of industry and living are made painfully clear when the figures are considered.

## *MATERIALS, NOT MONEY*

IN the descriptions of this plan for the expansion of her supply industry, there is no sign that America is worried about total capital investment, or manpower, or coal; considerations that so bedevil British planning in the field. But there is a common difficulty in the matter of materials, copper being the outstanding problem in the U.S.A., and as a result of this a case has to be made out to the authorities, if plant building is to be possible. In their fight to obtain allocations of scarce material, the American undertakings and the Government agencies that represent them meet with difficulties that are not unfamiliar to us in this country. The response of the utilities is to cry that they have already cut down their plans as far as safety permits; that the programme that seems so large by British standards may prove insufficient. America may, it is suggested, face a power shortage in some areas if the full programme is not realised, or if water conditions are unfavourable. At top defence-planning level, where immediate needs are presumably accorded more weight than long-term economies, the call is for 30,000 MW of new plant in the next three years. Behind this target must lie the intention of allocating to the electricity supply and manufacturing industries the necessary materials, despite the priority considerations of so many other claimants. That is a measure of the importance which the United States Government attaches to electricity as a munition of war as well as a necessary concomitant of civilised peace.

## *AID FOR INVENTORS*

ANNUAL reports of Government organisations seldom make exciting reading, so the brightness of the National Research Development Corporation's second report came as a pleasant surprise when it appeared on *Meteor's* desk. The Corporation, established under an Act of 1948, seems to be settling down admirably to its place in the machinery of British technological development. It has a twin task, first the handling of patenting and licensing procedure for inventions that come from Government departments and grant-aided organisations, and secondly, help for the private inventor to develop his ideas when the "public interest" requires it. Aside from the usefulness of its work in canalising Ministerial practice in patent matters, the most attractive feature of the Corporation's activities is its sane approach to this problem of the private inventor. It does not try to know better than industry: it merely recognises that industrialists are busy men, and that a good case must be made out to them if their attention is to be captured and their interest secured. So the interpretation of responsibility towards the private inventor that has been accepted stresses the importance of helping him towards the development of "a fully engineered prototype," which can demonstrate the soundness of his essential idea. Beyond this comes the important task of putting the inventor in touch with those particular industrial concerns which can best use his discoveries. The plan is a long-term one; and its effect when fully developed should be of marked importance for British industry.

Meteor

# LOAD FLOW ON THE GRID

## Line Outage Calculator predicts Effect of Switching Operations

By M. P. RATHBONE M.Eng., A.M.I.E.E.
and K. W. WARDROP B.Sc.(Eng.), A.C.G.I.

THE growth in demand for electricity in this country has brought a number of problems to the engineers responsible for load despatching on the 132 kV Grid system. One of these problems is the control of the loading of individual transmission lines so that the disconnection of any line, due to a fault or for maintenance purposes, does not give rise to overloading of other lines and possible extension of a disturbance. Because of the complexity of the 132 kV Grid system, when run as a solidly interconnected system, it is practically impossible for the control engineer to estimate the effect of a line outage with sufficient accuracy.

Calculation of line outage conditions is too slow for routine purposes. The ideal solution to the problem would be to have a complete model of the system in the control room on which the actual loadings would be continuously represented. On such a model the effects of line loss or closure could be determined by direct experiment. An approach on these lines has many practical difficulties and the expense is clearly formidable. The line outage calculator described in this article is designed to tell the control engineer how the load in any line would be shared by the remaining network should the line in question be disconnected. With this information and knowledge of the existing system loading he can assess the load on the system under any line outage conditions. There is the added advantage that this information is applicable to any loading of the system if the switching arrangements are constant, and the calculator can be readily operated by the control engineer without lengthy calculations.

### *Theory*

The magnitude of the power flows on the Grid system may be calculated to a reasonable degree of accuracy by assuming that the product of power and reactance is a measure of the voltage drop in a line. The problems can then be treated on a direct current basis by the application of Kirchoff's Laws. The calculator is based upon this assumption and application of the superposition theorem. Fig. 1 demonstrates the principle underlying the calculator

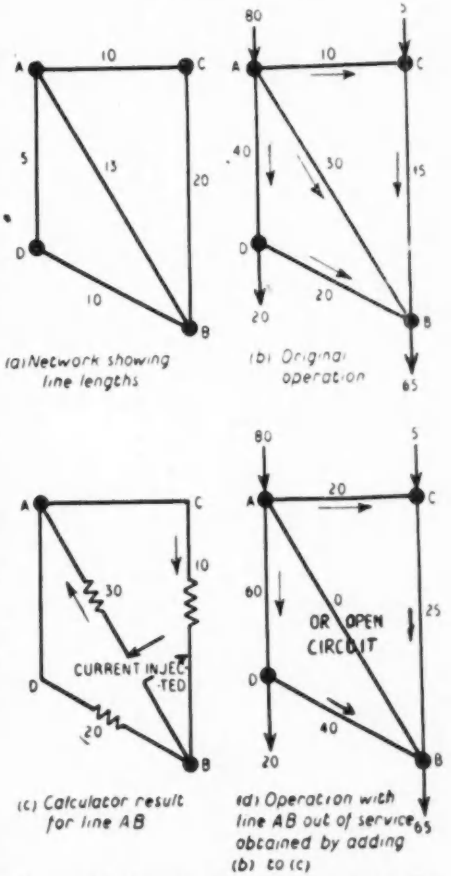
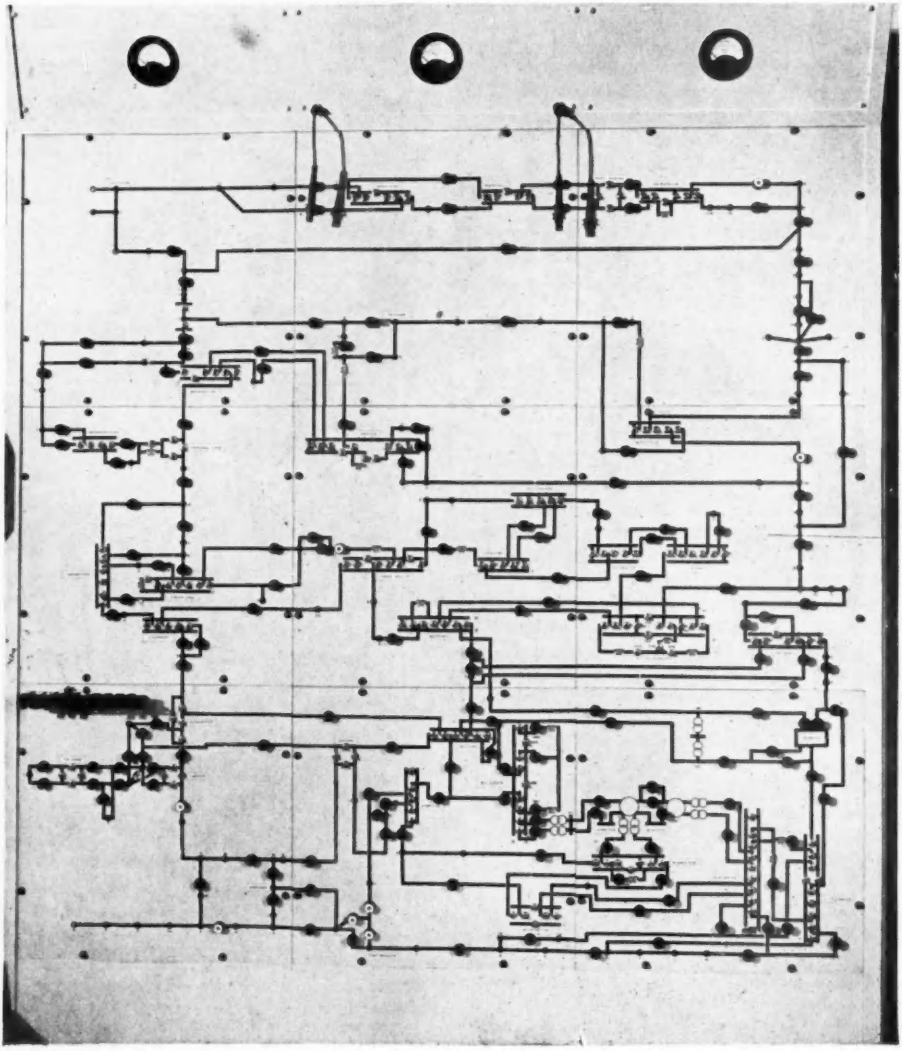



*Fig. 1. Diagrams showing how the superposition principle is applied in the calculator to the solution of network problems involving load flow*

measurements. Fig. 1(a) shows the line lengths of a simple network ABCD, and Fig. 1(b) a normal loading condition. To determine the effect of the loss of line AB the power flows are found with the power in AB injected in the opposite direction to its original flow with the remainder of the network dead, as shown in Fig. 1(c). These flows are then added to the original flows and the result obtained gives zero power in line AB, or AB open-circuited as shown in Fig. 1(d). The flows in 1(b) are known from the system metering and those in 1(c) determined by use of the calculator.

The superposition theorem can also be used to evaluate the effect of line closure. A flow of P MW is assumed in the line to be switched in, and the fractions of this power which will be superimposed on the rest of the system are determined by use of the calculator. The flows in the network with the line in service are then given as $(a+bP)$, where a is the original flow in a given line and b the fraction of power P

*Fig. 2. View of the calculator from the front, showing the complete Grid system representation*



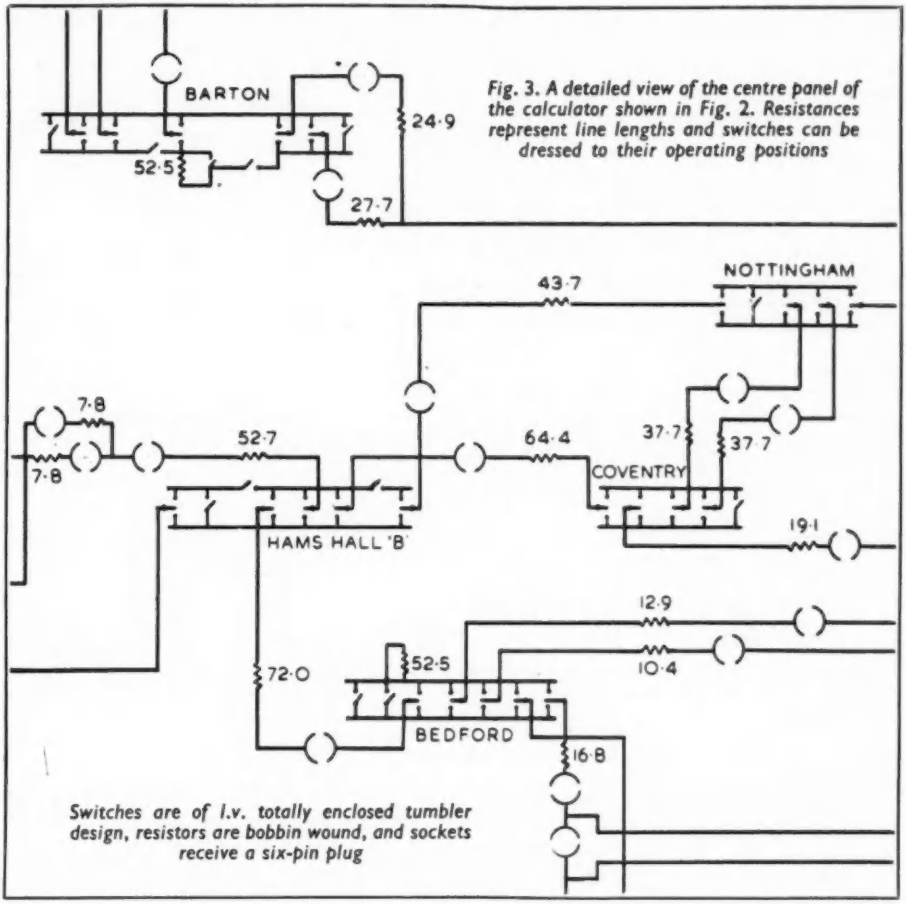



*Fig. 3. A detailed view of the centre panel of the calculator shown in Fig. 2. Resistances represent line lengths and switches can be dressed to their operating positions*

superimposed in that line. By multiplying these powers by the reactance or length of line and evaluating the sum of such products in any closed ring to zero, P is evaluated.

Thevenin's theorem can be used to determine the power flowing upon line closure. The current flowing in a switch subsequent to its closure is given by dividing the voltage appearing across the switch terminals on open circuit by the impedance of the network between the switch terminals. It may be assumed on the Grid system that if the voltage appearing across the synchroscope terminals is divided by the reactance, a figure proportional to the MW flowing in the switch upon closure will be obtained. The synchroscope voltage may be obtained from the system and a voltmeter has been incorporated in the calculator to give a measure of the system reactance, and so enable the effect of line closure to be determined.

### *Construction*

The Grid network is represented on the calculator in a simplified form. Load and generation are assumed constant during the time considered and are therefore not represented on the calculator. Current is injected in the line of interest, and flows in the remainder of the network are measured. Thus only circuits which are effectively in parallel with other lines are represented, and consequently all spur lines and transformer feeders are ignored. All circuit impedances are represented by resistance, 1 ohm representing one mile of 132 kV overhead line. Only one resistor is required for any transmission line supplying substations en

route, e.g. Cliff Quay-Peterborough, and switching arrangements have to be provided only at those substations where four or more lines terminate. As a result of these simplifications the entire Grid system has been represented by 195 resistors and 190 switches, all mounted on a 6 ft square panel. In detail the panel is subdivided into nine 2 ft square panels for ease of modification. All lines are represented on the front of the panel by black sellotape so that extensions to the system, which are very frequent at the present time, may be made easily. The front view of the calculator is shown in Fig. 2.

Each line section is fitted with a socket and short-circuited plug, six-pin plugs being used to give reliability. Low-voltage totally enclosed tumbler switches are used at the switching stations, and, after initial adjustment, have proved satisfactory. The resistors are bobbin-wound and screwed to the back of the panel. The wiring is panel-mounted and the panels interconnected by strip terminal blocks. The calculator is supplied at 50 V d.c. through a rheostat and milliameter to the injection plug, and a voltmeter scaled 0—2·5 is connected across this plug for recording the resistance of the network. Another plug is connected to a meter to measure the current in the various branches of the network. Fig. 3 shows a typical panel in detail.

## *Operation*

The calculator does not give the complete solution to the line-outage problem, but only the flows illustrated in Fig. 1(c). To operate the calculator all switches are first "dressed" to their correct positions, together with the correct operating conditions of all lines. Current is injected into a given line by the injection plug, the flow being in the direction of the arrowhead mounted on the plug. It is controlled by a rheostat mounted on the side panel and indicated by the right-hand meter. Normally 100 mA, representing 100 MW or 100% power, is injected, and then the power flowing in any other line is ascertained by replacing the shorted plug in that line by the branch plug. This current flows in the direction of the arrowhead mounted on the plug and is indicated on the centre meter. The results obtained from the calculator are added to the known flows in the network to forecast future conditions. When 100 mA is injected into the network, the left-hand meter labelled "synchronising factor" will give a reading proportional to the system impedance. The scaling factors are so arranged that if this reading is divided into the kV appearing across the synchroscope terminals, the power in MW which will flow in the line when switched into service will be obtained.

The calculator may be also used to a limited extent as a load flow calculator by injecting current at one station and withdrawing it at another. Several results obtained in this way may be added together, or added to a known loading condition to obtain a variant of that condition. It is also possible to add load and generation resistors at a later date and use the equipment as a normal d.c. load-flow calculator when all substations would have to be represented.

## *Conclusions*

The measurements made with this calculator are based upon many assumptions and so are necessarily only an approximation to practical conditions. Several comparisons with practical results have been made, however, and very good agreement obtained. As opportunity arises both the outage and the synchronising feature of the equipment will be checked against recorded occurrences, and experience in its operation gained. The calculator has already proved a valuable addition to the control room.

## SAFETY SIMPLIFIED

TWO recent publications of the Royal Society for the Prevention of Accidents should prove a great help to factory and site engineers. They deal, respectively, with the safety requirements of the Factories Acts 1937 and 1948, and with the Building (Safety, Health and Welfare) Regulations, 1948, and in each case they set out the requirements in clear language and in an arrangement well suited for reference.

Both texts were originally prepared for use by supervisors of Imperial Chemical Industries, and that dealing with the Factories Acts has already proved highly successful in private distribution. Probably the most valuable feature in both cases is the index, which has been carefully cross-referenced to permit rapid checking on any query that may arise. Though neither volume is intended to be a legal guide, each gives clearly and precisely the facts: definitions, direct requirements, exempts and exceptions and relevant statutory instruments are all clearly noted.

No specific mention is made of the electricity regulations under the Factories Acts, but both volumes contain many points of direct electrical importance.

Both publications are obtainable from the Royal Society for the Prevention of Accidents, Terminal House, 52 Grosvenor Gardens, London S.W.1, price 15s. each.

# Our readers' views ...

## Power Per Man

IN 1951, United States central stations sent out $370 \times 10^9$ kWh and added 7·5 million kVA to their capacity. Corresponding figures for the United Kingdom are $60 \times 10^9$ kWh and 1·0 million kVA.

The *Electrical World* of January 14, 1952, reported, "From the vicinity of the Defense Production Administration came a new tune—the electric power industry's three-year 30 million kW expansion program is, if anything, too conservative."

If production per man could be raised 20% in Britain, her troubles would be over—so the experts say. How can this be done when the U.S.A. is adding 30 million kW of power in a period in which the B.E.A. say they will add less than 5 million kVA and probably won't achieve 3 million kVA?

A man returned from England said the most lasting shock he received there was to see three men pushing a handcart through the streets of Manchester. That sort of thing used to be called "coolie labour." In the future it may come to be called "English labour."

*J. P. Thornton*

VICTORIA, B.C. CANADA

◆ ◆ ◆

## Underfloor Ducting

I SHOULD like to add the following remarks to the recent article on underfloor ducting.

Non-metallic ducts possess two further important advantages over steel ducts, (1) they are not in such short supply and (2) they are less than half the cost of steel ducts.

In fact they are so much cheaper than steel conduits of comparable sizes that I have specified their use in three recent jobs for carrying V.R.I. sub-mains in chases pre-cast in the site slab.

One point on which official guidance is lacking, is the capacity of these ducts. Guidance received from manufacturers of both types of ducting was of very little use and revealed a deplorable lack of enterprise. One manufacturer optimistically referred me to tables in his company's trunking catalogue, while another pessimistically suggested that the I.E.E. Regulations stated that the overall cross-sectional area of the cables should not exceed 33% of the area of the ducting, and recommended draw-in boxes every 20-25 feet.

Now that the abridged version of the I.E.E. Regulations is a reality, I think that the time has come for the complete edition to be expanded to cover fully all systems of wiring used on the consumers' side of the supply, I would draw attention to the following :—

(1) Bus-bar and rising main systems,
(2) Aluminium and aluminium alloy conduits with aluminium alloy and zinc alloy fittings,
(3) Copper conduit systems,
(4) Non-metallic conduit systems,
(5) T.R.S. cable in pre-cast ducts,
(6) Cable trunking and channel conduit systems,
(7) Underfloor ducting,
(8) Underground cables used as sub-mains,
(9) H.S.O.S. cables between buildings,
(10) Catenary suspension systems,
(11) Farm wiring systems.

Guidance on the suitability, ratings and capacities of the above systems is inadequate and fuller information long overdue. In cases where a system is too new to lay down definite regulations, recommendation in the form of an appendix to the regulations could be issued along the lines of the 1949 memorandum on aluminium alloy conduits. The industry has a right to expect a lead from the I.E.E. If the present Wiring Regulations Committee is not willing to give such a lead, it will do us all a service by making way for a committee which will.

*Ronald Croft*

HERTFORD B.Sc. (HONS.) GRADUATE, I.E.E.

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## Troubles and Remedies

REFERRING to your January 31 issue, I wish to thank your correspondent, Mr. Easton, for drawing attention to an error which inadvertently crept into my article on Troubles and Remedies in D.C. Generators.

The wording "Leading Edge" in Fig. 4 should, of course, read "*Leaving Edge*," the direction of rotation being clockwise.

The wrong wording naturally renders the curves incorrect, and I shall be pleased if you will kindly draw your readers' attention to this correction.

TIMPERLEY *S. Spence*

# *Wiring Direct* IN CONCRETE

## *Inflatable tubing makes work independent of steel*

STEEL shortage is having its effect on electrical contractors by making metallic conduit largely unobtainable. So it was with special interest that we accepted a recent invitation to visit a building site, where wiring was in progress using "Ductube" pneumatic tubing to allow cables to be pulled direct into concrete floors. Ductube has already been described briefly in these columns: an inflated tube is laid over the route of the desired cable run, and the concrete then poured. When the concrete has set, the air is released from the tube, and it can be withdrawn, leaving a smooth circular duct into which cables can readily be drawn.

In essentials, the use of Ductube is as simple as that. The rubber tubing has a reinforcing layer of braid incorporated, as shown in Fig. 1, and a pressure of 30 to 80 lb/sq in., according to size, is used for inflation. The tube is supplied in lengths up to 60 ft, and one end is sealed by a plug and circular clip, while the other is provided with a Schrader valve, a foot pump being used to blow up the tube. On inflation, the tubing, of course, increases in diameter, the $\frac{3}{4}$-in. size growing from $\frac{17}{32}$ in. to $\frac{24}{32}$ in., for example. There is also—and this is most important—a consequential shortening in length of some 10%. The tubing is fixed in its position in the inflated state; when the air is released after the concrete has been poured and set, it becomes diametrically smaller, and also lengthens. As a result, it snakes in the concrete-walled duct, and breaks the bond with the concrete.

### *Application*

When concrete is used on building sites, as for instance a large block of flats, the first essential is for the electrical contractor to obtain the co-operation of the builder. He does not want the Ductube tied-up waiting for other trades to do their work. But such is the ease of using Ductube, that once the contractor has become familiar with the technique, the tubing for one flat can be laid in position in a total time of one hour. No careful three-dimensional drawing-office calculations, sometimes essential for steel conduit work, are needed. Any time up to 24 hours after pouring, depending on site conditions, the tubing can be withdrawn from the concrete, and used on another area of the same job. Thus two or three sets of Ductube can, with proper planning, keep a large building site supplied with wiring ducts.

Tubing can be laid on a concrete slab or shuttering before the final screed is run, or if pot floors are in use, it can be run across the top of the pots. In the latter case, shallower

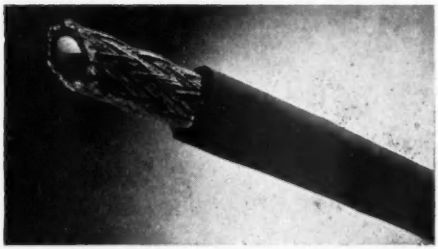


*Fig.* **1.** *Ductube incorporates braided reinforcement in its construction as shown here*

pots can usually be incorporated, if necessary, to ensure adequate cover for the tubing. When the concrete is poured, the air-filled tubing tends to rise in it. This means that some form of anchoring the tubing has to be adopted. One such method is shown in Fig. 3.

For switch drops, or runs along walls and partitions for plug points, a similar procedure can be followed, or a sanded course may be left in the brick work. Alternatively, chasing of the walls may be resorted to, as in normal conduit installations, but there is the disadvantage that the chase may have to be rather deep, and so more costly, to ensure adequate cover for the duct. Another possibility is to change to metal conduit, a smooth change-over being readily arranged with the interposition of a flanged boss between concrete duct and metal tubing.

At fittings boxes, etc., the tubing is run straight in and looped out again, as shown in Fig. 2. A smooth run for the cable is thus ensured. Various fittings for ceiling and wall positions are available, and more are being devised, but the versatility of Ductube allows plenty of room for individual inventiveness.

Normal practice is to pull in a draw-wire when the tubing is extracted from the duct, although some users consider this unnecessary. A wide range of cable types has been used in conjunction with Ductube, and all have drawn-in satisfactorily. In general, since the tubing will come out, cable will readily go in. Two or even more bends of 3-in. radius in a 40-ft. length are readily practicable, and the full possibilities are considered as still a matter for experience and experiment.

For accurate work, it is recommended that the tubing should stay in the conduit for something over 12 hours, but the time may have to be increased in bad concreting weather. If it is feared that the concrete will not have reached sufficient strength by withdrawal time, planks placed temporarily over runs will give sufficient protection from wheelbarrows, vehicles, etc.

### *Wiring and Troubles*

Should a duct be broken into, rectification is relatively simple. The concrete is chiselled out at the bad position and then a tube is drawn-in and inflated. Concrete applied locally allows matters to be set aright, with a smooth transition assured.

Condensation is an obvious worry with such a duct system, but in fact the concrete has properties of moisture absorption which lessen any risk of trouble with cables. Moreover, the thermal characteristics of the concrete correspond, of course, with those of the main building structure, and the danger of condensation is correspondingly reduced.

The normal practice on flats construction is for both ¾-in. and 1-in. diameter tubing to be used, with a preponderance of the former. On one typical scheme there were two "sets" of tubing, each set comprising the following: ¾-in. diameter, 4 lengths of 15 ft, 4 lengths of 30 ft, and 2 lengths of 60 ft; 1-in. diameter, 1 length of 60 ft. The outlay for one set, totalling 360 ft of tubing, was under £75.

### *Life*

Another factor in the economy of the use of Ductube is, of course, the number of times it can be re-used. Allowing for rough work on building sites this is put by the makers at 100, giving a cost of 0·45d. per foot of duct on a ¾-in. diameter basis. One user has quoted a cost of 1d. per foot, including all overheads, labour, etc. The 100 uses standard seems probably on the conservative side, as there are well-vouched-for instances of longer life.

For the contractor who does not wish to face the capital cost of purchasing outright a set of Ductube, hire schemes are available.

The photographs illustrating this article, and the information on which it is based, were obtained on a visit to a site at Barking where several blocks of flats are in course of erection. For permission to inspect these we are indebted to Mr. C. C. Shaw, the Borough Architect of Barking, to the Barking District of the North-East sub-area of the London Electricity Board, who are carrying out the installation concerned and, of course, to the Ductube Co., Ltd., of 235 Regent St., London W.1.

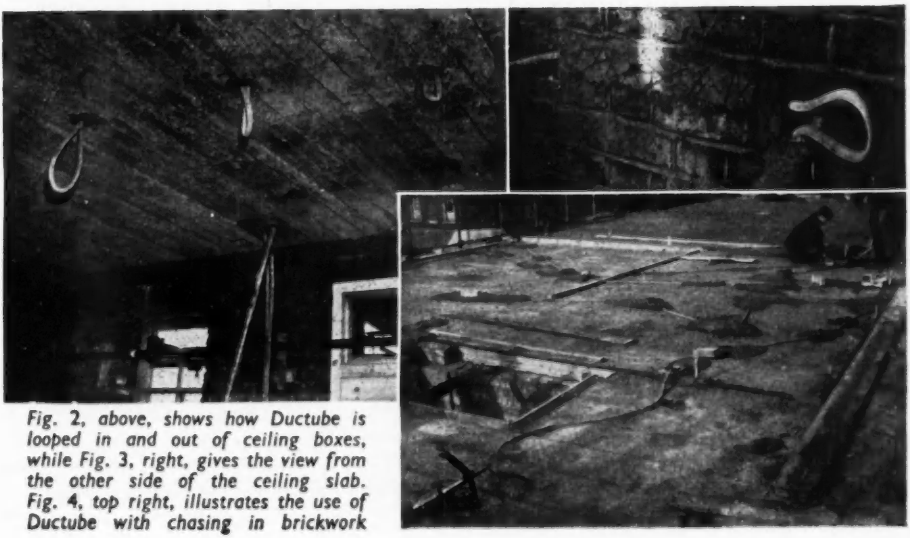


*Fig. 2, above, shows how Ductube is looped in and out of ceiling boxes, while Fig. 3, right, gives the view from the other side of the ceiling slab. Fig. 4, top right, illustrates the use of Ductube with chasing in brickwork*

*Notes on Wiring*
by MEGOHM

# PRODUCTIVITY

## *Considerations that affect the Electrical Contractor*

PRODUCTIVITY is a word that is in constant use today, and its general interpretation appears to be that we must all work harder. Stress is given to this point and the question of the efficient utilisation of materials and labour is left somewhat in the background.

Planning and the organisation of an operation, whether it is the mass production of electric cookers or the wiring of buildings, will determine the success or failure of the operation. Planning the mass production of articles within a factory is, however, a relatively straight-forward operation compared with the installation of wiring services, say, for a new factory where uncertain factors outside the contractor's control have to be considered.

Some factors affecting productivity on an outside wiring contract will be: (1) Planning of the entire electrical services to local outlet points and the preparation of a factual time table prior to commencement of work on site. (2) Building constructional work to be sufficiently advanced to enable a reasonably-sized operative staff to be fully employed and continuity of work assured to completion. (3) Working times to be common for all grades of operatives on site, emergencies excepted.

### *Full Planning Uncommon*

These conditions, most will agree, should not present great difficulty, but if these points are examined it will be found that very few wiring installations are fully planned prior to commencement of work on site and much of the actual planning is carried out as the job proceeds, usually as a result of pressure from the contractor's foreman and engineer for early information in respect to the positioning of points, etc., to obviate damage to constructional work. In some cases revisions to the tender drawings may be extensive and involve the complete re-planning of switch and distribution equipment, sub-main cabling, switching and positioning of outlet points. Further months delay may arise in obtaining final settlement and approval to proceed. In the meantime materials and equipment cannot be ordered and labour is withheld from site, resulting in general delay and increased cost of supervision.

Contractors men are sometimes called to site maybe to mark out a few holes and are at times held on site for weeks when there is little productive work to do. Needless to say, similar conditions sometimes apply on cable work where, for reasons known only to the client's representative, certain cables must be laid and jointed at short notice, necessitating overtime working. After the work is completed it is then disclosed certain essential equipment will not be available for some months ahead and the need for commissioning is to be deferred. By proper organisation, much of this time-wasting procedure could be eliminated.

### *Overtime Rates*

It is not unreasonable to suggest that working times for operatives engaged on a site should be equal, and any incentive given by the client by way of an extra hour per day at overtime rates should be common to all trades. It requires little imagination to foresee the discontent that arises where working times are not common, yet some authorities continue to operate such conditions and refuse to meet the additional cost of the premium or non-productive time payments made to the men by specialist contractors. One hour's overtime per day to men working away from home, I believe most will agree, is not an unreasonable practice. The working of long hours each week is, of course, a different matter and there is little doubt that many operatives are unable to maintain a satisfactory output per hour when called upon to work 60 to 65 hours per week over long periods with only an occasional Saturday and Sunday off. Under such conditions, which are certainly not wanted by contractors or the Unions who have stressed the need for a shorter hour working week, we may get productivity at a cost.

An examination of conditions necessitating continuous overtime working may reveal some interesting facts and point the way to curtailing expenditure. After all, the cost of wages paid to men on Sunday installing ¾ in. conduit can work out to approximately 3s. per foot run, which is a stiff price to pay for productivity.

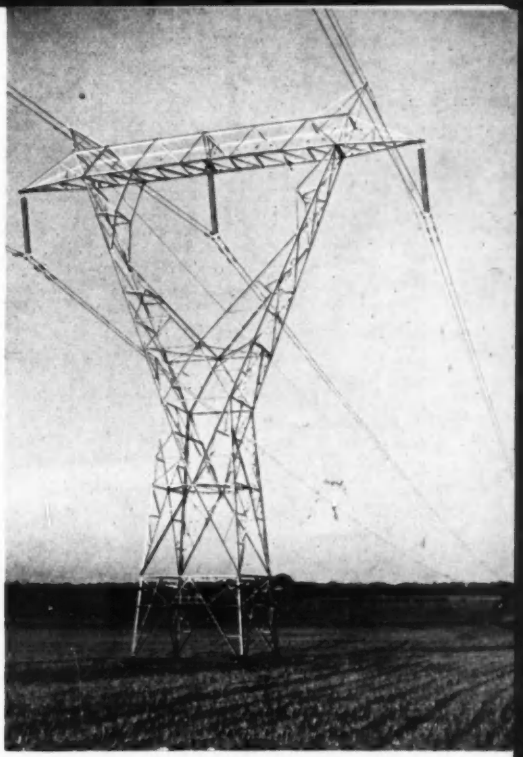
# 275 kV LINE STAYTHORPE—WEST MELTON

THE construction of the 20½-mile length of single-circuit 275 kV overhead line, which runs out from Newark to form part of the 41-mile circuit linking the new Staythorpe Power Station with West Melton, has been completed by B. I. Callender's Construction Co. Ltd.

This is the first portion of the new 275,000 V system which is to be superimposed on the British Grid and, consists of three pairs of twin conductors surmounted by two earthwires carried on waisted type galvanised lattice steel towers. Standard steel cored aluminium conductors and earthwires are used, the conductors being 37/·11 in. (0·175 sq in. equivalent copper section) and the earthwires 19/·11 in. The twin conductors are spaced 12 in. apart, this distance being maintained by spacers, each consisting of an aluminium rod having a pivoted cast aluminium jaw clamp, riveted to each end of the rod, to grasp the conductors.

A travelling cradle of Swedish design, which can be hand propelled along the conductors, was used for fixing the spacers on the sagged twin conductors. Three spacers per set of twin conductors are erected in each normal span of 1,200 feet. The conductor stringing presented new problems, in view of the necessity to preserve equal sags of the twin wires.

*The hand-propelled travelling cradle used in fitting spacer bars to register the twin conductors*



The conductors are supported by toughened glass insulators, the single suspension set consisting of eighteen discs having an overall length of 10 ft 8 in. The sixteen disc twin tension sets are 11 ft 4 in. long.

### *Tower Erection*

There are ninety-nine towers on this section of the line, eighty-four straight line, fourteen angle towers and a terminal. The steelwork for the towers was fabricated at Hereford, in the works of Painter Bros., to designs prepared by Blaw Knox Ltd. It is of interest that the straight line tower design was included in the Festival Year Stock List of the Council of Industrial Design. The suspension towers, which give a phase spacing of 32 ft 6 in., are 85 ft 9 in. high and weigh approximately eight tons. The angle towers are 83 ft high and their weights vary between ten tons and fourteen tons depending on their duty.

Foundation work commenced at the end of June 1950 and was completed by the end of October of that year. Tower erection commenced at the beginning of July 1950, but had to be interrupted because of inevitable delays in the delivery of steelwork and restrictions placed on the access to certain sites in order to safe-guard growing crops. The running of conductors was commenced during August of last year, and was completed a few days ago.

# Lighting for Safety

*ROAD ILLUMINATION PRINCIPLES reviewed by* *D. A. HART,* A.M.I.E.E.*

IF the average motorist were asked to define what he considered a well-lighted road, he would probably find unexpected difficulty in giving a definite answer. The motorist's reactions to lighting are subconscious. He recognises a road on which he can drive with confidence at night, without always being aware of the conditions that are helping him.

There is one cause of uneasiness in night driving of which the motorist is well aware. It is the risk of not seeing a pedestrian, cyclist or other vehicle until so close that he has to brake violently. A high level of illumination does not in itself remove the danger. Light-coloured objects may still be discerned too late to avoid hard braking and its risks. The merit of good street-lighting is not its overall brightness but what is known as "revealing power."

Objects are seen best as contrasting silhouettes against a light road surface. For good revealing power, therefore, the street-lighting installation must exploit the reflection properties of the road surface, so giving a high surface brightness without illuminating objects on the road too strongly.

## *Types of Lantern*

The type of street-lighting lantern most widely used has a light distribution described as "non-cut-off," which means that light is emitted at fairly wide angles to the downward vertical. A single lantern of this type forms a light patch on the road shaped roughly like a letter "T," with a distinct "head" stretching across the road and a bright "tail" extending towards oncoming traffic. In a complete street-lighting installation the bright appearance of the road surface results from the juxtaposition of numbers of these T-shaped patches.

In such an installation it is difficult to avoid light from the more distant lanterns being directed straight into the driver's eyes. This effect is not disturbing, if the whole road surface is sufficiently bright. On roads where the surface is rough and dark, however, glare due to light received direct from the lanterns may be troublesome. In such circumstances it is desirable to use a lantern with a cut-off distribution, in which hardly any light is emitted at angles above about 75° from the downward vertical.

With cut-off lanterns, the bright tails of the usual T-shape patches are eliminated, and each lantern forms a single bright band. The lanterns must therefore be spaced closer together so that the bands of light are continuous, with a slight overlap. When possible, cut-off lanterns are placed in the middle of the road so that each illuminates the carriageway and footpaths from side to side.

With cut-off lanterns there is no undue

* *Exterior Lighting Dept., The General Electric Co.*

build-up of brightness in the middle of the road, to the detriment of the sides, such as would occur with centrally-mounted non-cut-off lanterns. In some circumstances central mounting is the only method practicable, but it is still possible to avoid the close spacing of a cut-off installation by using semi-cut-off lanterns. In a lantern of this type the intensity is maintained only up to about 80° from the downward vertical. Glare from the more distant lanterns is thus diminished. The T-shape patches characteristic of non-cut-off lighting are still formed but the tails are shorter and they overlap less, so that the middle of the road is not unduly bright.

In the types of installation described so far, the lanterns have to provide for traffic in both directions, although it is only light emitted towards a driver that is of use to him. On a one-way road or dual carriageway, it is advantageous to use a lantern with a uni-directional light distribution. With this arrangement lanterns using lamps of 125 watts, for example, can produce lighting which in a normal installation would require 400 watts. Moreover, on a double-carriageway road lighted in this way a driver's attention is not distracted by the light from lanterns which do not concern him. At one time it was thought that lighting of this type in a one-way street might not be acceptable to pedestrians using the thoroughfare in both directions, but experience with such an installation on a busy thoroughfare in Manchester has shown that there is no adverse reaction from the public whatever.

### *Road Junctions*

A factor distinct from revealing power but of equal importance to it, is the necessity for a street lighting installation to show the limits of the road as defined by the kerbs, the positions of junctions, and the direction of bends. To show both the course of the road and its confines, the footpaths as well as the road surface must be made bright. Kerbs are shown best when the riser is in the shadow, and this is achieved most satisfactorily when the lanterns are mounted over the kerb or even a little behind it. Junctions are made obvious by the side road kerb facing the oncoming driver. If a lantern is placed in the main road about 40 ft. beyond the junction, this kerb will be conspicuous as a band of shadow, and the buildings on the side road visible to the driver will also be in shadow compared with those facing the main thoroughfare, so that the break in the continuous line of buildings at the junction will be clearly apparent.

A driver emerging from a side road on to the main road at a T-junction is helped if a lantern is placed over the far kerb of the main road, opposite the middle of the side road. This arrangement breaks up the normal pattern of lanterns seen by the driver and makes the existence of the junction obvious to him. A similar arrangement of a lantern facing the middle of each approach road is recommended at roundabouts, where it calls attention to the

*These three views show, top to bottom, mercury lighting with 400 W lamps, sodium lighting using 140 W lamps, and finally fluorescent lighting with each fitting housing four 80 W lamps*

obstruction formed by the central island. There is much to be said for using a unidirectional lantern in this position, as each lantern is then seen only by the drivers to whom it applies and the pattern of lights at the roundabout visible from an approaching vehicle is less confusing.

The principles described in this article are unaffected by the type of light source in use, but discharge lamps—mercury vapour, sodium and fluorescent—have made widespread extensions and improvement of street-lighting economically practicable because of their high efficiency. Fluorescent street-lighting has some attractive characteristics such as the pleasing colour of the light and the low surface brightness of the lamps and lanterns, with consequent reduction of glare. Installations of this type are higher in initial cost, but civic authorities are showing increasing interest in them, particularly in town centres with handsome architectural features. Skilful design of equipment has so far improved the appearance of lanterns that in recent installations the lanterns and columns positively enhance the dignity of their surroundings.

# Voltage Regulation for Signalling

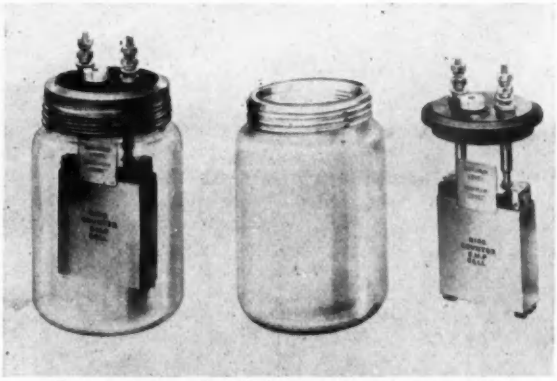
RAILWAY colour light signals are usually supplied with power from a storage-battery/rectifier installation. This permits a comparatively wide range of voltage to be applied to the signal lamps, depending on the state of charge of the battery. In the standard "Nife" Telesel signalling equipment, the battery will stand overcharging for continuous periods without increasing maintenance. Thus it is possible to use a 10-cell battery unit operating at 15-15·5 V. If a power cut or mains failure occurs the voltage will drop to 13 V and, finally, at full discharge will only be giving 11·5 V.

To overcome this variation Nife Batteries have developed a counter e.m.f. cell which is connected in series with the main battery. It has effectively no capacity and can thus be short-circuited with impunity. The cell is, in effect, a non-linear resistance with a time function. A "power-off" relay cuts the cell out of action by short-circuiting it in the event of a power failure.

The action of the cell is best described by a practical example. When first installed, or after a power failure, the cell will produce a back e.m.f. of 1·9 with normal current flowing through it. The 15·5 V of the charged battery is thus reduced to 13·6 and the voltage at the signal lamp will be about 13·1, allowing 0·5 for drop in the cables.

During the first 24 hours of use, the back e.m.f. rises to 2·0 V, and with one 12 V, 12 W lamp in circuit (and occasional double loads when "double yellow" aspect is used) will stabilise after about 100 hours to 2·2 V. The lamp voltage is thus 12·8 with 0·5 drop in cables. When "double yellow" aspect is used the back e.m.f. increases by only 0·1 V and the lamp voltage falls to 12·7 V.

Should a mains failure occur the cell is short-circuited, the battery voltage drops to 13 and 12·5 V is then applied to the lamps. This drops to 11·5 V as the battery reaches final discharge. Thus, the variation is reduced from 4 V to under 1·6 V.



*The counter e.m.f. cell showing general construction*

By this system, a smaller main battery is required, as it can be maintained fully charged and a more constant voltage is applied to the lamps, giving them a longer life.

# PATERNOSTER MEMORIES

*An account of the early days of National Control's wartime home*

By S. C. PATRICK

IT is now common knowledge to all that the B.E.A. National Control is situated under the shadow of St. Paul's Cathedral, in Paternoster Square. Consisting of a two-storey, prefabricated building, it has been erected upon a site which was laid bare during the past war, by the concentrated attack on the City of London. Prior to its transfer to its present location, the National Control was installed beneath ground level at St. Paul's Underground station. What is not common knowledge, however, but a fact that may be of interest to the staff who served in those subterranean regions, is that there is an historic connection with electricity supply in that a converting substation was installed there way back in the truly pioneering days of 1898-1899.

The railway station was then known as Post Office (which title held until the change to St. Paul's in the 1930s) and was the last station but one on the tube line known as the "Twopenny Tube," so called because that was the cost of the fare from Shepherds Bush to the Bank. This line was standard gauge, but the third rail, the positive, was in the centre of the two running rails, one of which was bonded solidly to the tunnel lining. The generating station at Wood Lane supplied five substations.

The distribution was 5,000 V 3-phase 25 cycles, and the converting plant, consisting of shunt-wound rotary convertors, of 900 kW rating was manufactured in America by G. E. Co. for the B.T.H. The step-down transformers were "Made in Germany," and were of the air blast type with the exception of one bank which was oil immersed, water cooled.

At the Post Office, an unusual feature was the installation of one substation containing two convertors at the very bottom of the two lift shafts (some 180 ft deep) and another substation equipped with the water-cooled transformers and one convertor, built just below the ground level, beneath the booking-hall.

It was the normal practice to run the lower substation throughout the week, and to change-over to the top substation for the weekends, and should any plant be out of service the two substations were run in parallel.

Much praise can be given to the excellence of the rotary convertors, some of which are indeed still running, though the armatures have been rewound and mechanically reinforced to allow the machines to run at a higher speed in consequence of the change-over from 25 cycles to 33⅓ cycles supply, which took place about 1928. This was brought about by the transfer from the Wood Lane 25 cycles supply, to the Lots Road 33⅓ supply, with the associated increase in speed of the rotary convertors from 250 to 333⅓ r.p.m. The substations at Post Office and at Marble Arch were shut down in the autumn of 1928.

## *Care of Commutators*

The necessary grinding and stoning of the commutators on the rotary convertors was quite a problem, in that the machines had to be motored from the d.c. side. One day, however, it was decided to design a motor and bedplate, with a worm gear drive, which was rigidly bolted on to the end of the armature shaft in order that the armature could be rotated as required for the grinding of the commutator. Everything was all set, and the order was given to switch on the supply to the motor. This was done, and all present were delighted to see the armature start to rotate. Now (wait for it) when the trial run had reached the desired speed, the order was given to switch off supply from the motor! Yes, it does not require much imagination to visualise what happened, especially when I say that the armature, of 7 ft diameter, weighed some 12 to 15 tons. Though the gearing, motor and bedplate were smashed, fortunately nobody was injured. Particulars, with a sectioned diagram of these G.E.Co. rotary convertors built in Schenectady, can be found in "Polyphase Electric Currents," edited by Professor Sylvanus P. Thompson in 1900.

As a small consolation to the staff of National Control who spent all of their working days throughout the past war in the lift-shafts of St. Paul's station, their forebears who preceded them (one of whom was my late brother) had no supply of water available in the lower station, and were nearly always working in temperatures exceeding 100° F. Indeed, at Notting Hill Gate a temperature of 126° F was recorded during June, 1927. I know because I was on shift and recorded it.

# METAL RECTIFIERS TODAY

## *Progress and Future Possibilities Reviewed before A.S.E.E.*

METAL rectifiers were discussed in relation to their manufacture, properties, and their wide range of present day applications in a lecture delivered to the Association of Supervising Electrical Engineers on Tuesday last, by MR. D. ASHBY, B.SC.(Eng.), M.I.E.E., A.M.I.Mech.E. In an historical introduction to his talk, the lecturer recalled that the copper oxide rectifier was introduced in 1925, while the selenium rectifier became available some ten years later. Being smaller and more efficient, the selenium rectifier in due course superseded the copper oxide type for most power applications, and wartime developments enhanced this superiority. Selenium rectifiers up to 1,000 kW in rating have now been installed.

### *Manufacture*

The copper oxide rectifier is manufactured by heating a sheet of copper in air to 1,050° C and subsequently quenching in water. One side is arranged to be unoxidised, while the other is treated to expose a layer of red (cuprous) oxide. Intimate contact is made with this by means of gold vapourised on to the matt surface. Washers bearing on the two surfaces then provide the necessary connections.

For the selenium rectifier, steel or aluminium sheet is used as the base, and a thin layer of selenium is pressed on this in the vitreous, non-conducting form. Pressed on to the supporting plate under heated platters, the selenium becomes plastic and semi-conducting, and adheres to the plate. Subsequent heating at a temperature just below melting point of selenium converts the layer to the conducting form. A layer of alloy sprayed over the selenium then provides the second element.

### *Characteristics*

Metal rectifiers need a minimum voltage in the forward direction to make them conduct at all (0·3 V copper oxide, 0·6 V selenium), but thereafter have a linear voltage/current characteristic. Operating current density is about 100 mA/sq cm of active rectifier surface. The reverse direction has generally similar characteristics except for scale. For a copper oxide, rectifier working voltage is about 6 V reverse peak, while the corresponding figure for a selenium rectifier is 25 V. This reverse voltage can, with a different process, be raised to 42 V without seriously affecting forward resistance, and to 84 V at the cost of high forward resistance, with suitability for low currents only.

Forward resistance increases during the first few hundred hours of life, but thereafter remains stable. The change is nowadays only 2% to 3% over several years of life. Rectifier life may be shortened by excessive temperature. Efficiency varies little with varying current; a range of 88% to 92% over a 10% to 100% current range is common. Because of its commutating action the rectifier produces an apparent power factor, and for a three-phase bridge circuit, the form in which it is normally employed in power circuits, this is 0·95.

Rectifiers are usually designed to operate at about 70° C, allowing a safety margin of 10° C for contingencies. While natural cooling obviously has many advantages, oil cooling is useful when the load is of several kilowatts rating. Forced air cooling with high wind speeds may reduce rectifier life, but it has compensating features when weight is of first importance, as in aircraft.

Relay applications depending on the rectifier's non-linearity are many: in the lecture some are described which help protect switch contacts, prevent acoustic shocks in telephony, and provide a surge absorber on power systems.

### *Developments*

The demand for rectifiers has shown a consistent upward trend, increasing during the last war, but not falling appreciably when production was changed to peace-time requirements. There seems, said Mr. Ashby, no reason to suggest that the rectifier has reached a stage beyond which no vital improvements will arise. Work is in hand to raise the operating temperature without affecting the performance, which will further increase the economic limit of output. Weight may be reduced by employing different materials for the supporting base of the rectifier element, and improved protective finishes are under consideration.

The germanium crystal is being developed as a power rectifier and shows very promising results, an extremely small unit producing a very high efficiency.

# Problems and Practice

## IN ENGINEERING

### *Arc Welding Capacitors Save Fuses*

A HEAVY engineering shop was fitted at 45 ft intervals along each bay side, with 30-amp t.p. switch-fuse outlet sockets, to serve portable 300-amp a.c./d.c. welding sets. During a particular stage of the manufacturing programme a bottleneck in welding construction occurred due to insufficient portable welding sets. To overcome this, three 300-amp single-phase a.c. transformer welding plants were temporarily transferred from another department. After a short time trouble was experienced through the blowing of fuses in the outlet socket circuits. These fuses were wired with 22 s.w.g. tinned copper, a maximum size for the fuse carriers, and the rupture was apparently due to fuse deterioration after a single phase welding transformer had been connected to the particular socket.

The fuse failure did not necessarily occur whilst one of these sets was actually connected to it, but on occasions, even when a set was working from it. These latter failures, however, were fortuitous, as it was apparent that two of the three fuses which usually failed had deteriorated during previous use by the single-phase transformers.

The 300-amp. welding currents were, of course, taking heavier currents from two phases for the transformers than a similar welding current from the three-phase motor-driven d.c. sets. It must be stated that the failures only occurred after a heavy weld by a $\frac{5}{16}$ in. dia. electrode, during one particular stage of the work and that during the remainder of the welding operations when mostly 6 or 8 gauge electrodes were used no trouble was experienced.

To overcome these fuse failures, an 8 kVA condenser was mounted on a flat bottom truck, making it portable, and a 30-amp t.p. switch socket, similar to those fitted around the shop, fastened by bolts to the condenser terminal box cover. This outlet socket was then connected across the condenser terminals, whilst from the same terminals a short length of t.r.s. cable was connected, through a cord grip entrance, to two pins of a 30-amp. t.p. plug. Whenever the $\frac{5}{16}$ in. dia. electrode was to be used by the single-phase transformers, the condenser was wheeled to the site. the single-phase set plugged into the socket on the condenser, and the condenser then plugged into the supply socket.

The improved power factor of the transformer relieved the occasional overload on the fuses and no further trouble was experienced. The one condenser was sufficient to serve three transformers in turn, whenever the heavy welding operation was required, but for the smaller size electrodes it was not used, and the mobility of the welders unimpaired.—*T.H.S.*

### *A Curious Motor Fault*

RECENTLY a small d.c. blower came into our workshop for repair. The trouble was that the commutator sparked very badly, and the motor was running above its proper speed. As the brushes were of the fixed type, neither the sparking nor the speed could be controlled. The field coil had recently been rewound, but there had been no alteration in the number of turns. The armature and the commutator were rather warm, so I tested for a short or open circuit in the winding. I found the armature to be quite in order. Another cause of sparking could be a high commutator bar, which would momentarily interrupt the circuit and make the brushes jump; but I drew a blank here—the commutator was quite in order. I was completely baffled, so decided to dismantle the motor and make a thorough examination of the component parts. I examined the field circuit for a possible loose joint, but found the connections sound. As I was doing this, however, the position of the field casting struck me as a little unusual, and I felt sure that this had something to do with the fault. I moved the field poles to a horizontal position and reassembled the parts. The armature buzzed round quite free of sparking —here, undoubtedly, was the cause of the trouble. The position of the field casting, was tantamount to changing the position of the brushes, usually described as "a wrong brush position." The coil is under the field just as the commutator bar connected with it is leaving the brush. This would cause a spark. Actually the coil should have been midway between the poles as the commutator bar is leaving the

brush. Had the brushgear been movable it would have been an easier matter to rectify the trouble.—*Surge.*

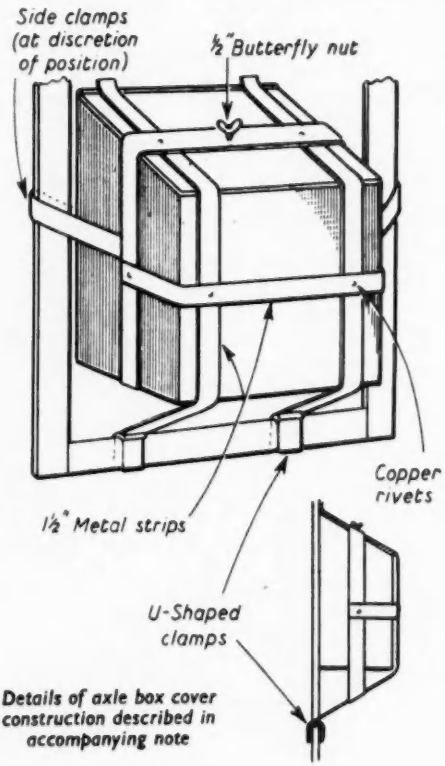
### *Wagons on Tipplers*

PERHAPS station engineers will have met this particular problem, and if the enclosed drawing will help to convey the idea it may be of assistance. When British Railway wagons are shunted on tippler type weighers, the oil—not axle grease, now—runs down the axle into the axle boxes. The boxes not being in the normal vertical position let the lids fall open and the oil runs out on the weigher and platform. As a result, the area is soaked in oil. Dealing with the problem sets several difficulties.

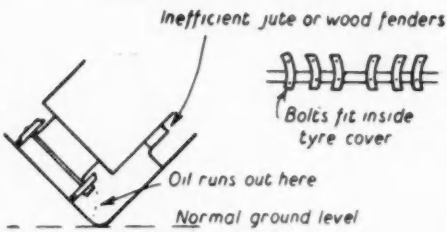
(1) Time factor. One wagon approximately five minutes on platform—sufficient time to attach a quick-fitting gadget to eliminate this.

(2) Is the operation of placing them on *two*-wheel axle boxes going to be additional labour ?—No, because they can be fitted quickly and taken off quickly !

(3) Is it preferable to have a fitting permanently attached to wagon tippler structure or to use detachable fittings ? It can be arranged to fit something to weigher, but this will not have the obvious advantages of a movable fitting, and will be subject to a heavy strain.




Details of axle box cover construction described in accompanying note




The oil problem—and a fender solution

The accompanying drawing will give an idea of the proposed clamp. This may be modified to deal with the particular problem involved.

A drawing showing wagon tilted will show the problem.

Another problem I have personally dealt with is that of inefficient fenders. Old ones were previously of wood, or matted jute rope. A well-known firm were consulted by my employers who have since fitted a strong and reliable form of fender-cum-shock absorber. These now take the form of segments of old tyres securely bolted to the cross framework and they deal satisfactorily with this bugbear.—*W. W. Hopkinson.*

### *Wasted Water*

I WAS asked to attend to a fault on a 1½ gallon storage type electric water heater, which was fitted over a kitchen sink. It was not an electrical fault but concerned the water circuit.

The fault was that at intervals of about half an hour, approximately an eggcupful of hot water would discharge "automatically" from the spout (outlet), and would occur only so long as the current was switched on, and the contents of the heater hot.

It presented a problem—but my elementary knowledge of plumbing gave me the answer. After turning off the water supply at the main, I replaced the washer in the inlet cock on the heater—turned on the water supply—and all was well.

The old washer was worn, and had allowed a very small quantity of water to by-pass, thus causing "expansion" at intervals.—*R. H. G. Holloway.*

*Contributions to this page dealing with specific items of interest to electrical engineers and maintenance men are welcome, and, if accepted, will be paid for at our standard rates. Problems of a practical nature to which a solution is required will also be considered. Contributions should be written on one side of the paper only and may be accompanied by sketches, which will be re-drawn for publication.*

# B.E.P.C. PROGRAMME—1952

PRELIMINARY information has now been released concerning the programme to be followed during the three-day British Electrical Power Convention which is being held at Bournemouth this summer from Monday, June 16 to Wednesday, June 18. All business meetings of the Convention on Monday are to be held at the Town Hall and on subsequent days in the Concert Hall Pavilion, while all the social functions have been arranged for the Ballroom Pavilion.

The programme is as follows:

**MONDAY, JUNE 16**

10 a.m. Opening of Convention—civic welcome—presidential address by Mr. P. V. Hunter.

2.30 p.m. Sir Arthur Fleming: "A Survey of Research in the Electrical Industry."
Dr. S. Whitehead (E.R.A.): "Co-operative Research in Industry."
Dr. J. S. Forrest (B.E.A.): "Research in the Supply Industry."
Dr. K. J. R. Wilkinson (for B.E.A.M.A.): "The Nature of Research in Manufacturing Industry."
Mr. W. F. Simonson (W.T.B.A.): "Researches into Some Problems Associated with Steam Generation."

2.30 p.m. (*cont.*)
Dr. J. N. Aldington (for E.L.M.A.): "The Influence of Research on the Electric Lamp Industry."
And a further paper from the C.M.A.

4 p.m. Ladies' Tea—to meet Mrs. Hunter.

8-8.30 p.m. Reception by the Mayor and Mayoress of Bournemouth.

**TUESDAY, JUNE 17**

10 a.m. Dr. R. S. Vincent: Lecture and demonstration "High Performance Dielectrics with Special Reference to Power Factor Improvement."

12.30 p.m. E.A.W. luncheon.

2.30 p.m. Papers on "The Merits of the Electric Water Heating, Electric Cooking and Heating Loads on an Integrated Supply System."

7 p.m. Annual dinner and dance.

**WEDNESDAY, JUNE 18**

10 a.m. Electrical Forum—a panel selected by the Council will answer questions which have been submitted prior to the meeting.

11.30 a.m. Annual General Meeting.

# Politics Affect T.V. Sales

WHAT is claimed to be the first comprehensive set of sales information to be assembled on a year's sales of television and radio sets was issued recently by the Radio and Television Retailers' Association. The figures show that at the peak period of 1951, in April, sales of radio sets averaged 17·3/shop on a national basis, and of television sets (in relevant areas) 15·6/shop.

Two outstanding features were noted during the year: the increase in purchase tax brought about by the April Budget, and the impact made by the opening of the Holme Moss television station. Rumours that purchase tax would be increased were widespread before the Budget, and this caused early buying. Afterwards, there was a rush to purchase sets that were in the shops at pre-Budget prices, and the record April sales figures resulted. The heavy buying, however, had the result of making the seasonable summer decline even more marked than usual.

An anti-purchase tax campaign took its effect around the time of the October election, and when a change of government failed to produce early changes here, the publicity that had been given continued to act as an inhibitor of buying.

The effect of Holme Moss opening has been to produce an average sale of over 20 sets/shop/month in the area concerned, whereas established television areas averaged only10 sets/shop/month.

RADIO SALES—SETS/SHOP

| | National Average | Al'xandra Palace | Sutton Coldfield | Holme Moss | Non-TV Areas |
|---|---|---|---|---|---|
| Jan. | 12·3 | 11·5 | 15·4 | — | 10·0 |
| Feb. | 12·8 | 14·0 | 15·0 | — | 9·0 |
| Mar. | 12·1 | 13·1 | 13·6 | — | 9·2 |
| Apr. | 17·3 | 18·6 | 17·7 | — | 14·6 |
| May | 8·4 | 8·6 | 9·0 | — | 7·2 |
| June | 6·3 | 5·8 | 7·7 | — | 5·4 |
| July | 7·2 | 7·8 | 8·4 | — | 5·3 |
| Aug. | 7·5 | 7·0 | 8·3 | — | 7·5 |
| Sept. | 10·2 | 12·1 | 9·0 | 10·6 | 7·1 |
| Oct. | 9·5 | 10·5 | 8·1 | 9·3 | 8·8 |
| Nov. | 9·2 | 9·8 | 6·6 | 11·0 | 8·5 |
| Dec. | 11·2 | 10·5 | 10·4 | 15·3 | 8·9 |

TELEVISION SALES—SETS/SHOP

| | National Average | Alexandra Palace | Sutton Coldfield | Holme Moss |
|---|---|---|---|---|
| Jan. | 9·8 | 10·0 | 9·5 | — |
| Feb. | 12·1 | 13·1 | 10·9 | — |
| Mar. | 12·1 | 13·8 | 10·4 | — |
| Apr. | 15·6 | 15·1 | 16·1 | — |
| May | 6·4 | 7·0 | 5·9 | — |
| June | 3·3 | 2·9 | 3·7 | — |
| July | 3·1 | 2·9 | 3·3 | — |
| Aug. | 4·5 | 4·3 | 4·9 | — |
| Sept. | 8·8 | 8·8 | 7·1 | 10·8 |
| Oct. | 12·4 | 9·0 | 9·1 | 21·7 |
| Nov. | 14·3 | 10·2 | 11·2 | 25·0 |
| Dec. | 15·1 | 13·7 | 13·6 | 19·9 |

# Eire's Supply Bill

## PLANS FOR THE NEXT TEN YEARS

IN moving the second stage of the Electricity (Supply) (Amendment) Bill, 1951, last week, Mr. Lemass, Minister for Industry and Commerce, said the purpose of the Bill was to raise the advances to the Electricity Supply Board by £22,000,000, and it was estimated that this should meet the Board's requirements until 1955.

Of that sum £12,500,000 would be spent on increased generation, £4,000,000 on the extension programme, £4,000,000 on distribution, and £1,500,000 on general purposes and contingencies.

It had been the practice of the Board to invest its own reserve in the undertaking, and the total capital expenditure and commitments on capital account, now exceeded the limits set by existing legislation. By 1955, it was estimated that expenditure and commitments would again exceed the maximum which the present Bill would permit.

The Board anticipated that the demand for electricity would double in the next five years, and increase by as much again in the following five years. This year, the prospective demand was 1,075 million units and output would be about 1,140 million. Demand had, in fact, grown so rapidly that there was no question of having standby plant. It was hoped the Board would be able to meet the demand for 1952 with the aid of the Erne scheme and the Allenwood turf-burning station.

In 1954 the new Cork station (oil or coal fired) would come into action, and at the end of five years, with the aid of turf-burning units the output should be at 2,084 million units/year against a demand of 2,020 millions.

For the following five years, four hydro stations would be built on the Avonmore river, the Boyne and the Clady river. Other stations to burn turf were also to be erected, and the Board had under consideration the development of a further 10 or 12 smaller rivers. The Board had also been asked to consider the possibility of using small turf-fired plants in Western Ireland to use hand-won turf.

### *Rural Electrification*

Although the development of rural electrification had been accelerated in 1951, the Board was now encountering difficulties in the shortage of technical staff and in material and equipment. Only 20% of the scheme had been completed to date. It was now obvious that the original estimated cost would be much exceeded as in 1943, when the Act was before the House, the calculations had been based on pre-war prices.

Replying to Mr. J. Hickey, the Minister said that the total amount the Government was authorised to advance to the E.S.B. was £36,945,000. The Board's actual capital expenditure was about £50,000,000, but it had received in cash from the Exchequer only £26,000,000. Provision had been made in the Bill for increased pensions for E.S.B. employees.

After some discussion on points of detail, the debate was adjourned.

# British Standards

**Gears for Instruments and Clockwork Mechanisms, Part I Involute, Spur, Helical and Crossed Helical Gears** *B.S. 978:Pt. 1:1952. Price 2s. 6d.* In revising this British Standard, which was first published in 1941 as a war emergency standard to assist in the reduction of types and sizes of gears used for instruments and the cutters for producing those gears, it was decided to produce the new issue in four parts. The present publication applies to machine-cut involute, spur, helical and crossed helical gears of 20 to 200 D.P. for instrument and clockwork mechanisms. It provides for two classes of gears, Class 'A' for use where a high degree of accuracy is required, and Class 'B' for all other applications. The standard recommends that all spur gears should have involute form with the exception of those in weight-driven or spring-driven mechanisms in which the pinion is the driving member when the cycloidal may be preferred, and it recommends the use of diametral pitch for the expression of standard pitches. The remaining parts of this standard, which are in course of preparation, and which are likely to be issued at an early date, are: Part 2, Cycloidal type spur gears; Part 3, Bevel gears; Part 4, Worm gears, has not yet been started, but will be undertaken when the revision of B.S. 721—Worm gears—has been completed.

**Packaging Code.** *B.S. 1133*: Section 5. *Price* 2*s.* Exporters of non-metallic materials often have to contend with spoilage of their products resulting from attack by moulds, bacteria, insects, mites or rodents. The avoidance of such attack presents a difficult problem because it is necessary in each instance to consider the compatibility of possible protectives with the article itself and with the material from which the container is made. Moreover, a protective which gives excellent service for one product in a given type of package when it is sent to one area, may break down completely if an identical article in an identical package is sent to an area with different climatic conditions. Packers can assist in avoiding this type of damage if the article cannot be protected during the manufacture, and guidance on the steps they can take to achieve this is given in this standard.

# TELEVISION and Observation

## *Applications of T.V. technique to extending Visual Range*

AN interesting Paper, dealing with the potentialities of television technique in extending the range of observation of the human eye was given to the Royal Society of Arts last Wednesday by Mr. J. D. McGee. The author began by pointing out that it was surprising that so little had been done, up to the present, to exploit the possibilities inherent in television technique of "seeing" in wavelengths beyond the capability of the human eye, and in the capacity for visual memory which existed in the television camera.

The applications discussed at the lecture fell into three categories. (1) Those in which the essential feature was the separation of the receiver and the transmitter. (2) Those in which advantage could be taken of the extended range of wavelengths of radiation to which a television pick-up tube could be made sensitive. (3) Those in which the "memory" (or capacity to integrate electrical charges produced by an optical image) of a pick-up tube was used to extend observation.

### *Spatial Extension of Vision*

In the field of spatial transmission, apart from the presentation of entertainment by the B.B.C., one of the more publicised activities was that of the televising of surgical operations for the training of students.

A practical equipment for this purpose had been installed in the operating theatre of Guy's hospital, and had been most satisfactory. Initially trouble had been experienced with the large white areas representing the surgeon's and nurses' smocks, and the towels, bandages and swabs used. This resulted in tube overloading and consequent lack of definition over the working area. It could, however, be minimised by dyeing the white items green.

Conditions where human observation was difficult or impossible could be dealt with by the television camera. Examples of this were the finding of the *Affray*, the television of dangerous processes and the viewing at a distance of dangerous testing to destruction.

### *Frequency Extension*

While the human eye was sensitive to light wavelengths lying between 4,000 and 6,500 A.u. the photo-electric effect extended in different materials from less than 2,000 to 12,000 A.u. or even more.

Thus by using a mosaic surface of silver, silver oxide and caesium, a television tube could register invisible light between 6,500 A.u. and 12,000 A.u. in the infra-red region. By this means bodies at temperatures about 300°C could appear luminous.

At the other end of the scale, a photo-electric surface of antimony alloyed with caesium could respond well down into the ultra-violet wavelengths. This was of particular importance where microscopy was concerned, as by using the shorter wavelengths, higher resolution was possible. At the moment this field had not been developed, but an instrument using ultra-violet light in conjunction with a television camera was being built.

### *Memory*

In all television pick-up tubes a certain amount of "memory" existed. This was due to the fact that the liberation of photo-electrons by the incident light was instantaneous, but the consequent charges on the mosaic were retained until they were discharged by the scanning electron beam. This phenomenon could be used in conjunction with the p.p.i. display on radar so that other information such as diagrams, charts, etc., might be superimposed on the radar picture by simultaneous optical projection on to the storage tube.

The memory function could also be used to permit the television of still pictures or slowly moving objects over a narrow frequency band circuit of about 100 kc/s instead of the normal 3 Mc/s. It was also possible to obtain stroboscopic pictures by this means.

### *Astronomical Observation*

The television camera had a sensitivity 5 to 10 times as great as that of the fastest commercial film for the same exposure. Further, the integrating function of the charges was such that the same effect as a time exposure could be attained. Thus by leaving the television camera exposed for some time, then scanning the mosaic, a bright image of such things as distant stars could be reproduced on the receiver for a few frames. These could then be photographed for record purposes.

# *THE CABLE SHIP "STANLEY ANGWIN"*

DETAILS of the cable ship *Stanley Angwin*, belonging to Cable and Wireless, Ltd., have recently been released. She was launched from the Neptune Yard of Swan Hunter and Wigham Richardson last week, without ceremony or speeches, owing to the King's death, and will be finally commissioned in midsummer.

The ship is designed to carry a deadweight of about 2,200 tons on a draught not exceeding 19 ft. Three cable coiling tanks are provided and for paying out, a clipper stem carries three cable sheaves. Main engines are located aft, the cable tanks being forward. Two independent cable gears are fitted abreast on the main deck forward, and these work on full boiler pressure. The windlass engine is fitted in a separate compartment on the main deck, the cable lifters on the upper deck being operated by vertical shafting.

The main propelling machinery consists of two triple-expansion engines having cylinders of 15 in., 25½ in. and 44 in. diameter, and a piston stroke of 27 in. Design i.h.p. on trial is 1,450 at about 104 r.p.m.

Steam is supplied by two multi-tube Scotch boilers generating saturated steam at 220 lb/sq. in. and burning oil fuel under forced draught.

An unusually wide range of navigational aid equipment includes radar and deep sea echo sounding gear by Kelvin and Hughes, and a comprehensive range of transmitting and receiving wireless and telephonic equipment by Marconi International Marine Communication Co., Ltd.

Electricity supplies are provided at 220 V d.c. by three 40 kW generators, two units being steam driven and one diesel.

With an operating range of 10,000 miles, a coiling capacity of 18,000 cu ft, equivalent to 400 miles of deep sea cable and a maximum speed of over 11½ knots, the *Stanley Angwin* will be the most modern and up-to-date cable ship afloat.

She is due to leave the Tyne in May, and will then move to Greenwich to load cable. From Greenwich she will proceed to Singapore to relieve *Recorder*, and her area of operation, containing 20,000 miles of cable, will stretch from Colombo eastward to the Pacific Ocean.

# Infra Red for Final Polish

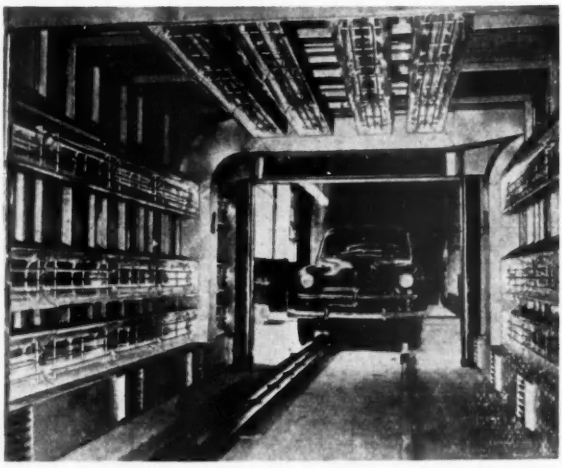
INFRA-RED ovens, supplied by Metropolitan-Vickers Ltd., are used by Vauxhall Motors Ltd. to speed-up the final cleaning and paint touching-up which is necessary before new cars leave the factory. Two ovens are involved, the first completing drying of the car after it has been washed down, and the second providing quick drying for any paint that has to be applied afterwards.

Each oven incorporates infra-red element projectors of a three-bar type, mounted in ten rows. The elements used consist of a spiral of high-grade heat-resisting wire tightly embedded in magnesium oxide, and enclosed solidly in an outer sheath of a non-scaling, non-corrodible alloy. Anodised aluminium sheet is used for the trough reflector, to ensure maximum heat reflection combined with protection from atmospheric corrosion.

The necessary air recirculating system is driven by a 2½ h.p. fan which displaces 4,000 cu ft/minute, dampers being provided in each main duct to allow adjustment of the ratio of recirculated and fresh air. Infra-red projectors, airflow switches and the chain conveyors on which the cars travel are all interlocked to prevent overheating. In addition, the heat output of the oven is controlled by Sunvic energy regulators, with the incidental advantages that voltage fluctuations are compensated.

In the first oven 50 projectors are used, giving a total load of 300 kW, while the 40 projectors in the second installation dissipate 240 kW. Heat losses from the ovens are reduced by the use of heat insulating panels lagged with glass wool and finished on the inside with asbestos hardboard. These panels are readily removed to give access to the projectors and their wiring. Prevention of unauthorised interference with controls, is allowed for.

*This drying oven incorporates forty 6 kW projectors*

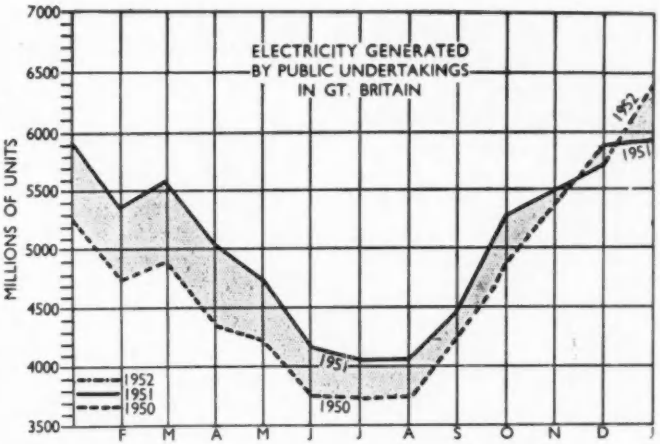


### UNITS GENERATED

6,353 million units was the total generated during December in stations under the control of the B.E.A., the North of Scotland H.E. Board and the Lochaber Power Co. The corresponding figure last year was 5,628 million, so there has been an increase of 6·7%.

Of the total, 6,111 million units were generated in steam stations, and 224 million in hydro-electric.

Energy sent out during the month was 6,007 million units, 94·4% of that generated, and 6·7% up on the corresponding total for 1951.




# POWER SUPPLY IN FEBRUARY

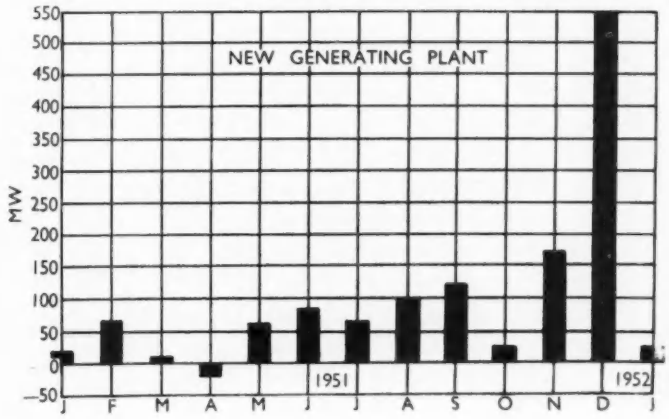
AS is not uncommon after the December spurt in plant commissioning, the B.E.A. has no new turbo-alternators or boilers to report as commissioned during January. Attention can therefore be centred on the generation statistics for a month during which the average temperature was 38·3° F, some 1·9° colder than that 12 months' earlier (40·2°F) and 3·6° colder than in 1950.

At 6,353 m., units generated compared with 5,946 m. in January 1951 and 5,275 m. in 1950, showing yearly increases of 6·8% and 12·8%. The disproportion between these increases is probably due to the colder December that preceded January of last year, and the more severe shortage of solid fuel then obtaining.

The growth of hydro installations is well represented by the increase in power obtained from this source in Januaries since 1949: 139 m., 136 m., 145 m., and 224 m. have been the totals recorded, the North of Scotland Hydro-Board contributions being 84 m., 82 m. 101 m. and 157 m.

Complete figures are now available for the monthly simultaneous maximum load on generating systems in Great Britain, excluding railway and transport generating stations. The heavier demand was in December, at 12,829 MW, 80% of the average installed capacity value of plant in that month. In 1950, December was top month with 11,762 MW from an installed capacity of 14,924 MW, ratio of 78·5%.

The lowest of the monthly maximum loads in January came in July, with 8,718 MW, and in eight of the months of 1951, the maximum simultaneous load exceeded 10,000 MW. Only three years earlier, in 1948, 10,307 MW was the maximum load for the whole year.




### GENERATING PLANT

At the end of January, 1952, the installed capacity of the B.E.A. was 15,711 MW, showing that no change had occurred during the month. During the same period the North of Scotland total went up by 23 MW to 640 MW. The month's commissionings bring the overall increase during the past twelve months to 1,252 MW, or 8·3% of the January, 1951, total.

The total installed capacity used for the purpose of this graph should be distinguished from the output capacity. The installed capacity is the total m.c.r. of all the generating sets which are connected on both steam (if appropriate) and electric sides, and are suitable for service.

# *Progress in Production during* 1951

## LANCASHIRE DYNAMO GROUP

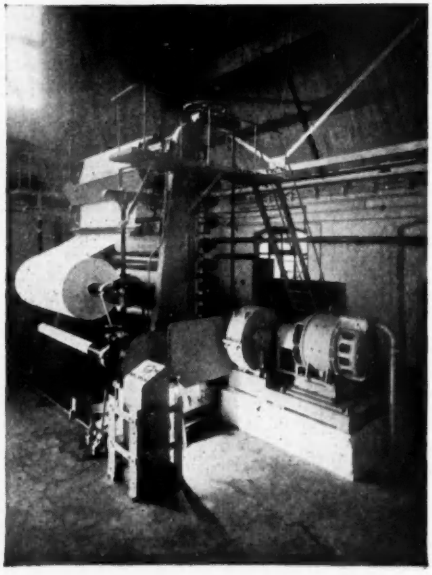
THERE has been no recession in the demand for L.D.C. totally-enclosed fan motors, and continuous progress in design has enabled the "Fankuld" and "Corcooled" ranges of this type of induction motor to fulfil the requirements of the constantly expanding field of application.

An interesting alternator has been built for use in a new generating station in South Africa. This is an 11 kV, 1,500 r.p.m. salient-pole revolving-field machine having a continuous maximum rating of 750 kW at 0·8 p.f. It is to be located at a height of 3,865 ft above sea-level and illustrates the increasing demand for 11 kV alternators of comparatively small outputs. In accordance with L.D.C. practice for 11 kV alternators, the stator core has open slots which allowed the coils to be completely formed and insulated before insertion.

The rotor shaft and pole cores are machined from one forging, and strip-on-edge field cores are clamped under solid bolted-on pole shoes.

*11 kV alternator 750 kW with self-contained air-filters. This is to be installed in South Africa at a height of 3,865 ft above sea level*

*160 h.p. Varionic drive in a paper mill for controlling a calender. The operating desk can be seen in the foreground*



### *Foster Transformers and Switchgear*

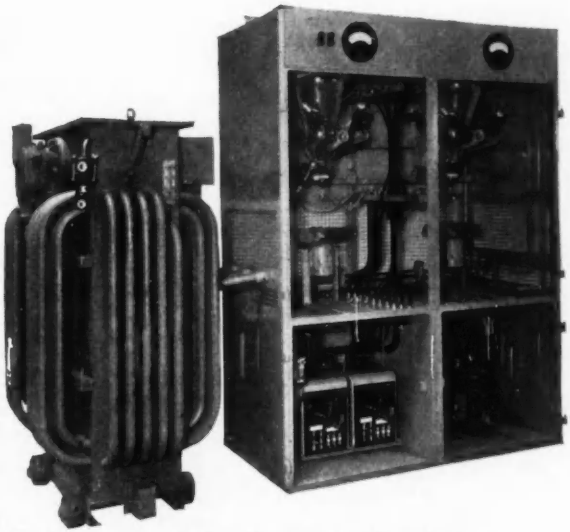
Many interesting new transformer orders were received by Foster Transformers and Switchgear during 1951. Among these is one for fifteen 2,000 kVA, 44 kV units for the Hydro Electric Power Commission of Ontario, whilst a repeat order was obtained for several 1,000 kVA units destined for the 33 kV network of the Manitoba Power Commission. Other contracts completed include the shipment of 70 distribution transformers ranging from 50 to 500 kVA in size to the State Electricity Authority of Uruguay.

The past year has also seen a considerable increase in the production of voltage regulating equipment for home and foreign customers, of the type required by laboratories and specialised factory processes.

### *Crypton Equipment*

Records were established in every phase of the business of Crypton Equipment Ltd. Export orders reached a record and amounted to nearly 60% of the company's total sales, showing an increase of nearly 50% over export orders for the previous year.

*Rectifier cubicles with control equipment housed in dustproof enclosure*



During the year, the switchgear side of Foster Transformers was transferred to Crypton, and production began in the Bridgwater factory. Despite production difficulties, Crypton produced no less than 1,665 fuse switches and 76 switchboards.

On the battery charging side a new fast charger was produced which utilised the temperature of the electrolyte as a control. This enables batteries to be charged in 30 to 60 minutes with the assurance that the battery cannot be damaged by the high current.

A new instrument, the "Hydrolek," was developed, which will be, in effect, the first electric hydrometer available in this country. It will go into production in the course of the next few months and is expected to have a great future in the field of battery testing.

## *Nevelin Electric Co.*

The number of orders received by Nevelin during the past year would seem to confirm the general preference for the glass-bulb mercury-arc rectifier as a source of d.c. for industrial use, and despite the serious difficulties created by the shortage of materials, production capacity has been expanded to keep pace with the increased demand.

Twin bulb units of large size, giving 6-phase rectified output, have been used on several industrial equipments, including a group of six units with a total output of 3,260 amps in a 750 kW bank. The more usual type of 6-anode glass-bulb rectifier has also continued in demand, and a bank of seven cubicles of this type with a total output of 1,955 amps was supplied to the order of the North Thames Gas Board for gasworks power supply.

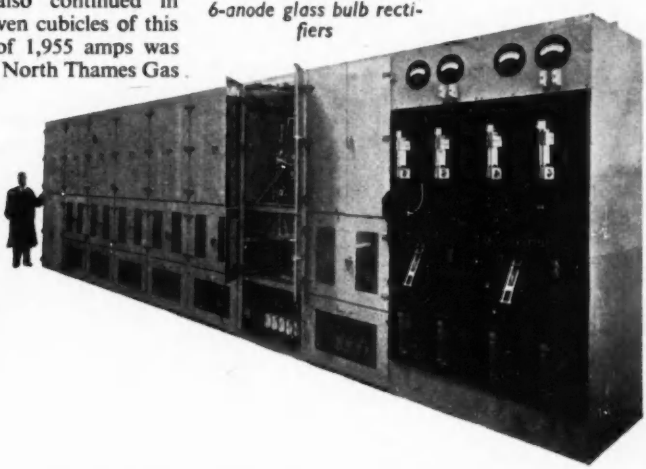
The demand for Varionic drives has shown a marked increase and equipments with ratings in excess of 500 h.p. are in hand. Both manual and automatic control of the motor speed are included, in several cases with change-over facilities.

## *British Electronic Products*

The increasing use of electronic control for continuous industrial processes is reflected in the greater output from B.E.P. A major activity during the year has been the development of a range of standard units which can be connected to deal with complex systems.

The largest installation commissioned during the past year was a fully automatic electronic Ward-Leonard type drive for the de-scaling line of a well-known steel company in South Wales. The installation controls a number of motors totalling some 200 h.p. and includes all electrical control gear, inter-communicating telephone, etc.

*7-cubicle installation of 6-anode glass bulb rectifiers*



# overseas news

### Western Australia Expansion

Tenders are soon to be called for the two initial 30,000 kW generators to be installed in the new power station being planned for Bunbury, Western Australia, Premier McLarty announced recently. The station will have an ultimate capacity of about 200,000 kW. This and the Collie power station which had been enlarged at a cost of £300,000, would tie up with the South-West Power Scheme which the Government was pushing ahead. South Fremantle and East Perth power stations would supply more than 150,000 kW for the metropolitan area. East Perth power station—until June the metropolitan area's only source of supply—was being rehabilitated, and tenders had been authorised for new plant costing about £1,000,000, he added.

### Boiler Trouble at Bunnerong?

Allegations that four boilers at Bunnerong power station, Sydney, were so seriously corroded that they would have to be scrapped or rebuilt, which were made by the Minister for Public Works, Mr. Cahill, were refuted earlier this month by Councillor P. D. Hills, chairman of Sydney County Council. Engineers of the C.C., he said, discovered pitting in the tubes of new boilers in section "B" of Bunnerong power-house in 1941. The Council immediately took action to prevent the excess oxygen from entering the tubes. Engineers found that one of the four boilers in section "B" was completely unaffected by corrosion. They replaced the tubes in one of the damaged boilers. The other two boilers were not as badly corroded as the one that was repaired. Because of the heavy electricity demand the Council kept them in service, he added. Mr. Cahill said earlier that with Bunnerong's four largest boilers likely to break down at any time he hesitated to say how Sydney would fare with blackouts this winter. It would seem that he was preparing consumers for severe winter power cuts.

### Licensing Wiremen

Under the conditions of the new Act, produced by the collaboration of the Ontario Electrical Contractors' Association and the Provincial Council of the International Brotherhood of Electrical Workers, every electrical worker in the province of Ontario will be required to operate under licence. Mr. H. Patton, past president of the Provincial Council, has stated that the new Act, which may be known as "The Electrical Licensing Act, 1952," has become necessary, for up till now "it has been possible to drive a horse and buggy through the Hamilton regulations." The present arrangement is that each municipality issues licences and carries out tests; but there are areas where no tests are asked, no licences are issued, and anyone can operate as an electrician. This means that many householders may get electrical installations and find that Hydro inspectors will not pass them because they do not meet with safety requirements. Under the new Act, Mr. Patton said, people already operating, and to whom licences have been issued after they had passed tests, would automatically be granted licences; but others would have to submit to regulations on the matter of a test before licensing. The Act would insist on an apprenticeship minimum of four years, and would vest in the province, instead of municipalities, the right to make tests and to prosecute where regulations were broken. Electrical contractors will also be subject to the proposed new legislation and will also require a contractor's licence, after furnishing proof of capability.

### Another Danube Station

Erection of a generating station on the Danube, near Passau, the output of which will be shared by Austria, Bavaria, and the Federal German Republic, was agreed to last week by the Governments concerned. Annual output of the station is estimated at 920 million kWh, and its cost 160 m. marks, half of which will be paid by Austria, and half by the Federal German Republic and Bavaria jointly. The project involves the construction of an artificial lake partly in Austria and partly in Germany.

### New Warsaw Station

The first thermo-electric station in Poland which will supply the capital with electricity, steam and hot water for heating purposes by the end of 1953 is under construction in Warsaw. Already 75% of the ground work has been done and by the end of the first quarter of this year work on laying the foundations will begin. The U.S.S.R. is to supply the boiler equipment, turbines, transformers, etc., and will send engineers to train Polish fitters and technicians in the assembly of the machinery.

### Acquisition Rejected

Salisbury City Council, Southern Rhodesia, has rejected the proposal of the Electricity Supply Commission of South Africa that Escom should take over the city's generating plant, with the Corporation taking a bulk supply from them. At a special meeting the council decided

it was not at this stage prepared to consider the proposal. But stressed that this would not in any way debar the matter from further consideration by the council if at some later date more information regarding the proposed Kariba scheme and other matters relating to the integration of the two systems becomes available. The Commission estimated that if the Corporation agreed to the scheme, and took a bulk supply, it would have meant a saving of £2,250,000 of national capital. But Mr. J. E. Mitchell, city electrical engineer, has said that the council felt that the saving could just as easily be made without the Commission taking over. The council's decision might mean a certain amount of load-shedding during the peak periods in winter, but this was adequately offset in the saving in capital outlay that the alternative offered by the Commission would have entailed. In addition, if the Commission took over, the council would no longer have the say in what stand-by equipment was and was not required, he pointed out. The Commission had referred to the Kariba Gorge scheme: a feature of the report on the hydro-electric power scheme was that Kariba should supply all the power to Salisbury and the central area and that the thermal units should be closed down. But, said Mr. Mitchell, even big power schemes such as the T.V.A. had found it necessary to maintain, and even to augment, thermal units, in spite of their hydro-electric power. Such big schemes had a habit of bringing big development with them which ate up all the power and needed the retention of the thermal units. He did not see that the council's retention of its own generating plant at Salisbury would really affect the eventual integration of the system into any such major scheme.

### Grid for Algeria

Algeria's electricity output, which was 288 million kWh in 1938, 360 million kWh in 1947, and 586 million kWh in 1950, is expected to reach 700 million kWh in 1952 on the completion of the five year plan of the Gas and Electricity Administration. Of this expected output, nearly 45% will be generated by hydro-electric stations. Allied with this expansion on the generation side is the development of an inter-connecting 150 kV line, which will shortly be put into service, linking the towns of Oran, Algiers and Bone. This line, which is 562 miles long, will permit the pooling of the whole of Algeria's electricity resources.

### Transformer Requirements

Although production of mains transformers in India has expanded considerably during the past five years, it is only comparatively recently that firms have commenced making 33 kV transformers, extending their range to 2,500 kVA. The Government of India is helping industry by restricting imports, except where requirements cannot be met by local firms. But as India is seriously short of many of the necessary materials, and production in 1950 only amounted to a total of 270,000 kVA, there should be a substantial market for British manufacturers during the next seven years while India is almost doubling its electricity output. From an analysis recently made by Shri S. Rammohan, of the Central Water and Power Commission (Power Wing), it is estimated that the requirements of India during the next five years will be about 2,845,000 kVA of power transformers and 1,835,000 kVA of distribution transformers.

### Hirakud Scheme Revised

Having completed its enquiry into certain financial and technical difficulties encountered in the administration of the Hirakud Dam scheme, the special committee appointed by the Government of India is now preparing its report. Meanwhile there has been a considerable change in the construction programme. Construction has been divided into three stages. The first, to be completed by 1955-56, includes the main dam and four power units totalling 50,000 kW. In the second stage, spread up to 1960-61, the dam will be completed and power supply raised to 85,000 kW. The third will see the scheme brought to its full output of 200,000 kW. In the revised scheme, it will be seen, the main dam will provide flood protection as well as irrigation to about two million acres of land earlier, besides giving hydro-electric power, although the availability of power will be delayed by about two years.

### Auckland Getting Ready

Expenditure of £2,605,000 on development during the next two or three years is planned by the Auckland Electric Power Board, New Zealand, and application is being made for authority to raise the first £500,000. Of this sum £50,000 is for underground distribution (we noted on July 5 last that the Board had decided to adopt underground mains for the more densely populated sections of the area). Of the remainder, £75,000 is for control-room equipment, £450,000 for centralised load control, £100,000, for tramway requirements, £180,000 for distribution of Waiheke Island, and £1,000,000 for general extensions, etc. In applying to the Local Government Board, Mr. N. M. Speer, general manager, points out that plans must now be made for considerable expansion to provide for the great banked-up loading when power restrictions were removed. The distribution system is being planned and reorganised to meet foreseeable demands for the next 20 years. Whether all the work in prospect could be done within the next two or three years depended on deliveries of materials and the local labour position.

### Trolley Bus Order

The Auckland Transport Board has ordered 40 trolley buses from Britain at a cost of £350,000. The firm of Saunders-Roe, who are already building 140 diesel buses for the Board, will manufacture the bodies. The electrical equipment will be supplied by the British Thomson-Houston Co.

# *PERSONALITIES*

## IN THE INDUSTRY

**Mr. William H. Goehring** has been appointed managing director of Hobday Bros., Ltd., to fill the vacancy caused by the death of Mr. C. H. G. Hobday. Mr. Goehring was formerly associated with the U.S. Steel Corporation, and after active service with the U.S. Army during the late war, he served as Chief of the Finance and Economics Division in Bremen, Germany, with the U.S. State Department.

*Mr. Wm. H. Goehring*

The Council of the Institute of Welding has conferred the Sir William J. Larke medal, the highest award of the Institute, upon **Mr. W. S. Atkins,** B.SC., M.I.C.E., M.INST.W., for his paper "Continuous Welded Structures—Abbey Works, Port Talbot." Papers highly commended by the examiners were those of **Mr. J. Latimer** on "Automatic Welding," and **Mr. A. R. Moss** on "The Welding of Cast Iron." Mr. W. S. Atkins is the head of the firm of consulting engineers of that name, responsible for the design of the new Abbey Works of the Steel Company of Wales Ltd., at Port Talbot.

The many friends of **Miss H. S. O'B. Hoare** will be gratified to learn that, since her resignation as publicity manager for Ferranti Ltd., her services have not been lost to the electrical industry as she has now joined the E.I.B.A. Miss Hoare will devote her energies to matters of general organisation and will also act in the capacity of public relations officer.

At its meeting last week, Brighton Education Committee confirmed the appointment of **Mr. L. Duncombe,** B.SC.(ENG.), as assistant lecturer (Grade B) in electrical engineering at the Brighton Technical College.

**Mr. Alan Simpson** has been appointed head of the diesel generating stations in the eastern region (south) of the Central Electricity Board, Federation of Malaya, we learn. He moves from Kuala Lumpur, where he is at present second-in-command of the power station, to his new headquarters at Raub, in April. Before going to Malaya in May, 1950, Mr. Simpson gained early experience at the Stockport electricity works.

The Postmaster-General has appointed **Mr. K. Anderson,** C.B.E., at present serving as an undersecretary in the Treasury, to be comptroller and accountant general of the Post Office in succession to the late Mr. C. E. I. Jones, C.B.E.

**Mr. H. G. Towner,** area manager for Venner Ltd., is entering London Clinic next monday February 25, for an ear operation and expects to be away about a month. He recently completed 25 years service with the Venner organisation.

We learn that **Sir John Kennedy,** O.B.E., M.INST.C.E., M.I.E.E., will shortly be severing all connection with the Uganda Electricity Board. Any future communications for Sir John, who, we are glad to say, is in the best of health, should be sent to Woodstock, Chinthurst Lane, Shalford, near Guildford, Surrey.

A Fellowship of the Incorporated Sales Managers' Association, in recognition of outstanding service to the Association and to Sales Management, has been conferred on **Mr. G. W. Godfrey,** executive director, Radio Sales, of E. K. Cole, Ltd.

Chosen as the new station superintendent at St. Pancras power station, London Division of the B.E.A., is **Mr. J. H. Ramsden,** ASSOC.I.MECH.E., who, since October, 1948, has been deputy superintendent at Stepney power station. He gained early technical education at Bradford, where he was also a trainee in the corporation electricity undertaking, prior to joining the Northmet Co. with which he served for twenty years at Brimsdown power station, holding positions of combustion engineer and assistant engineer on maintenance before going to Stepney.

*Mr. J. H. Ramsden*

The new chairman of the Electricity Supply Commission of South Africa, **Dr. J. T. Hattingh,** D.SC., whose appointment we briefly noted on February 7, has been on the staff of Escom since June, 1923. He gained earlier experience first with General Electric in America, and afterwards as lecturer in electrical engineering at Natal Technical College and in Physics at the University of Cape Town. His well-known book *A Universal Sag Chart*, which amplified his M.SC. thesis, has saved Escom much expenditure. His D.SC.

*Dr. J. T. Hattingh*

thesis, on the Petersen coil, was approved by Dr. W. Petersen, inventor of the coil. He has also written numerous treatises. During Dr. Hattingh's service with Escom he has taken a prominent part in the Commission's major undertakings. He was construction engineer at the erection of the Sabie hydro-electric station, and he was also responsible for the erection of the Iscor power station at Thabazimbi. In 1927 he was appointed research engineer and four years later became technical assistant to the chairman, then Dr. H. J. van der Bijl. In 1937 he was appointed consulting engineer and in February, 1949 he became a commissioner.

The Institution of Mechanical Engineers has awarded the James Clayton Prize for 1951, amounting to £1,550, to **Dr. H. Roxbee Cox,** chief scientist to the Ministry of Fuel and Power, for his contributions to engineering science and practice, particularly in the fields of aeronautics, power generation, and fuel utilisation.

**John D. Blythe,** who from December, 1945 has been employed by Aidas Electric Ltd., as technical representative for the area of the Southern and South Western Electricity Boards, is sailing with his family in the S.S. *Georgic* on March 21 to Canada. He is going to Toronto where he hopes to introduce British domestic electric appliances to the Canadian market. Mr. Blythe joined the Jackson Electric Stove Co., Ltd., in 1926 and represented them in the South and South West of England until 1939. During the war he served in the R.A.F., being demobilised with the rank of Flight Lieutenant and having been mentioned in despatches for his services on the continent.

The Marconi International Marine Communication Co., Ltd., announces that **Mr. John Keir,** manager of the Service Division, has now been appointed assistant general manager of the Marconi Marine Companies, these comprising also the Radio Communication Co., Ltd., and the Marconi Sounding Device Co., Ltd. Mr. Keir joined the Marconi Marine Co. in 1915 as a seagoing radio officer. He was later appointed instructor at Marconi House, London, and afterwards transferred to Glasgow as training representative for Scotland. After his return to London in 1919 he held various head office appointments until 1929, when he went to Brazil as managing director of the Companhia Nacional de Communicacoes Sem Fio, which he later reorganised as the Companhia Marconi Brasileira. Returning to the U.K., he was appointed contracts representative for the Marconi Marine Co. in Scotland in 1946. Two years later he again went to Brazil on behalf of the Marconi Companies, returning in 1949. In January 1951 he became manager of the Service Division, and will still retain responsibility for the work of this Division in his new capacity.

*Mr. John Keir*

## OBITUARY

**Mr. George Norris Wright,** who retired from his position with the London Generating Division of the E.E.A. in August 1949, died on February 15. Mr. Wright became chief electrical engineer to the former London Power Co. in 1938, having been assistant chief electrical engineer to the company since 1929. Apprenticed at Nuneaton, he later joined the North Eastern group of companies, ultimately becoming transmission engineer and technical assistant to the Cleveland and Durham Power Co. About that time he was chairman of the Tees-side subarea of the I.E.E. and also took an active part in the formation of the E.P.E.A. Subsequently he served for some years with the County of London Electric Supply Co., before joining the London Power Co. in 1926 as distribution engineer. He was chiefly responsible for the design and construction of the original 22 kV network, which is still doing yeoman service; and for the building up of the present e.h.t. system.

*Mr. G. N. Wright*

**Mr. John Lambert,** M.I.E.E., who was Perth's first burgh electrical engineer, died on February 14, aged 79. A native of Dundee, he went to Perth as burgh electrical engineer early in 1901, when the city electricity works were being constructed, and held that position till retiring in June, 1938.

**Mr. W. Innes,** M.I.E.E., formerly of the North Eastern Electric Supply Co., Ltd., died on February 12, aged 77. He retired from the position of chief engineer, Operation Department (Generation), and at one time was resident engineer at the original Dunston power station. A native of South Shields, he served an apprenticeship with John Readhead Bros., and joined the Newcastle Electric Supply Co. in 1902.

**Mr. M. W. Zambra,** a director of Negretti and Zambra from 1909 until his retirement in 1935, died on February 13.

**Mr. H. Johnson,** London manager of Joseph Lucas, Ltd., from 1898 to 1933, died recently aged 85.

**Mr. W. S. Graff-Baker,** B.Sc., A.C.G.I., M.I.Mech.E., M.Inst.T., M.Inst.Loco.E., chief mechanical engineer (railways) of London Transport, died on February 15, aged 62. He had spent a lifetime in the service of London's underground system, starting with the Metropolitan District Railway in 1909 as a junior electrical fitter. He became assistant to the mechanical engineer in

1912 and a year later was placed in charge of all lifts and escalators on the London Electric Railway and the Central London Railway. After a few months as personal assistant to the mechanical engineer he became, in 1921, car superintendent. In 1922 he was appointed an officer of the Underground group of companies, with the title of assistant mechanical engineer, a position he continued to hold after the formation of the London Passenger Transport Board in 1933. In February, 1935, he was appointed chief mechanical engineer (railways) to the board, and he has since been responsible for the major improvements in design which have taken place in London Transports rolling stock, lifts and escalators.

**Mr. A. K. Roxburgh,** M.I.E.E., formerly chief distribution engineer to the Clyde Valley Electrical Power Co., Ltd., died on February 15.

**Mr. Warren Storey,** M.I.E.E., M.Inst.C.E., a former electrical engineer to C.I.E. (the Irish Transport organisation) died on February 16. He resigned from the C.I.E. in 1948, since when he had been an engineering representative of J. Stone and Co., Ltd., of Deptford. Educated at St. Andrew's College, Dublin, and gaining early training with Egan and Tatlow, electrical engineers, Dublin, he joined the staff of the Great Southern and Western Railway as electrical engineer in 1911. He held the same position on the amalgamation of the companies in 1925. When the C.I.E. was formed he took charge of the electrical work of the new concern. Later he was given control of the electrical work of the tramway section. Mr. Storey was chairman of the Irish centre of the I.E.E. in 1935-36, and a past president of the Engineering and Scientific Association of Ireland.

**Mr. K. R. Mackley,** Liverpool manager of Crysel:co Ltd., died recently, aged 46. He was honorary secretary of the Liverpool centre of the Illuminating Engineering Society, and was also well known for his work for the E.I.B.A.

**Mr. H. Jacobs,** managing director of Photax (London) Ltd., died on February 17, aged 50.

# NEW LITERATURE

### *Synchronous Machines*

*by C. Concordia.*

FUNDAMENTAL circuit theory is the concern of this book and no excuse is made for placing emphasis on mathematical development. But there is no suggestion in this warning that the volume should be regarded as of dry, theoretical interest only. Its declared object, and one that it is well designed to carry out, is to aid the practising engineer-designer who wants to learn something about the transient theory of electrical machines, with the object of predicting performance. The mathematical treatment, although continuous and complicated, is not over-advanced: only some knowledge of differential equations and operational calculus is assumed. In a steady development of his subject, the author passes from a general mathematical description of the synchronous machine to a consideration of steady state operation. Short circuit currents and torques are then considered, while final chapters deal with starting torque and voltage dip. A useful bibliography concludes the work. Published by Chapman and Hall, 224 pages, 9 in. by 6 in. Price 44s.

### *Transformer Engineering*

*by L. F. Blume and others.*

ALL aspects of transformer design and operation are discussed in this admirable book, which now reaches its second edition. Though all the matters discussed are examined thoroughly, the work is essentially practical in nature; to quote the preface, "emphasis has been placed on presenting the essential physics concerned in each problem, rather than giving a complete and mathematical treatment. . . . discussions of only academic interest have been omitted." In following this admirable rule, the various authors concerned discuss first the circuit characteristics of transformers, their behaviour under fault conditions, and the various possible connections. Thermal characteristics, voltage regulation, and phase angle control receive attention, and then in final chapters such matters as insulation co-ordination and transient voltage characteristics are treated. In every way this volume makes an admirable reference book for the engineer who requires more information about power transformers. Published by Chapman and Hall, 500 pages, 9 in. by 5¾ in. Second edition, price 60s.

## BOOKS RECEIVED

**Mechanical World Electrical Year Book, 1952.** Published by Emmott and Co., 357 pages, 6 in. by 4 in. Price 3s.

**The Magnetron,** by R. Latham, A. H. King, and L. Rushforth. Basic study of construction and properties of magnetron for those without specialised knowledge of h.f. techniques. Published by Chapman and Hall, 142 pages, 8½ in. by 5½ in. Price 18s.

**Servomechanisms.** Collection of 17 Government Department reports dealing with the theory, design and operation of servomechanisms. Published by H.M.S.O., 293 pages, 9½ in. by 6 in. Price 63s.

**Job Grading.** Report of research on a job grading schedule for offices. Published by the Office Management Association, 8 Hill Street, London W.1, 44 pages, 9¾ in. by 7 in. Price 10s. 6d.

**Conference on the Use of Radioactive Isotopes in Industry.** Papers read at conference organised by F.B.I. in May, 1951. Published by the Federation of British Industries, 21 Tothill Street, London S.W.1, 52 pages, 8½ in. by 5½ in. Price 2s. 6d.

# *The* BUYER'S *Column*

## "Standard" D.C. Milliwatt Calibrator

THE testing and calibration of thermocouples demands a highly accurate and stable source of low-level power. From the viewpoint of accuracy and stability, the obvious basis for such a source is a standard cell, but for testing and calibration purposes a means must be found of obtaining appreciable power for any length of time. This problem has been successfully solved

*The Standard Milliwatt Calibrator is compact in its case*

by STANDARD TELEPHONES AND CABLES LTD., Connaught House, Aldwych, W.C.2, in their 74131-A.D.C. milliwatt calibrator which uses a Muirhead miniature Weston standard cell type D-550-A as the reference voltage in a circuit which places no load upon it.

The Standard cell e.m.f. is applied between one of the grids of a double-triode valve and earth, and a voltage derived from a potentiometer network supplied with stabilised d.c. is applied to the other grid. By adjustment of the potentiometer resistance, this voltage can be made equal to the standard cell voltage, and then used as a reference voltage, against which the standard output of 1 mW into either 600 or 75 ohms can be checked.

The Muirhead cell was chosen because it combines a high degree of accuracy and stability with robust mechanical construction, and because it is cheap to replace should this be necessary.

## Stotts' New Electric Ironer

AN interesting new electric ironer is now being marketed by JAMES STOTT AND CO. (ENGINEERS) LTD., Vernon Works, Oldham.

Emphasis is placed on the machine's efficiency and on the following special features. The roller pressure is easily released. It is easy and safe to operate and has an extra heavy rollertrough, control lights, and is of convenient size and simple construction.

These features mean big laundering economies to hotels, restaurants and boarding houses, plus the fact that their linen inventories can be smaller owing to quicker "turn-round."

The electric ironing machine is constructed on a strong frame of white enamelled steel tubing and is powered by a sturdy motor. Model L.585, rated at 3,000 heater watts, is powered by a ½ h.p. motor, and Model L.586, of 3,600 heater watts, by one of ¾ h.p.

A heavy cast roller with outstanding heat-retaining capacity is fitted, and the electrical heating system built in by a special method. The roller is lagged with hessian and covered with winceyette. Motor and heating are separately switched.

Control panel, knee control switch (for ironing roller) and foot-operated pressure lever are all finished in highly polished nickel plate. The table is of varnished hardwood. There is a clothes receptacle in white enamel finish, and the cloth guide under the ironing roller is of polished aluminium.

Shirts, pinafores, aprons, etc., can be ironed with complete success on this machine, due to the open-ended roller.

## Extending Rod Elements

PUT into production this month by MABRO AND CO., LTD., 42 Whadcoat St., London N.4, is a new model "Mabro" extending rod element.

The basis of the extendable element is a patented sliding centre bar system as shown in the illustration. It is available in two sizes. The advantage of these two sizes is that, between them, they cover the whole range of replacements for electric fires.

The fitting of the elements is simple. Each end

*The Mabro extendable elements make it possible to stock replacements for the whole element range*

is pulled out to the required length and is fitted. They are available in 200/220 V, 750 W or 1,000 W, and 230/250 V, 750 W or 1,000 W ratings.

Standard finish is nickel plated, the elements being individually boxed in very attractive packing.

The small size is 8 in., extending up to 12 in., fixed retail price 5s. each; and the larger size is 10 in., extending up to 14 in., fixed retail price 5s. 6d. each.

D

## Two New Rabaldo Shavers

ENTIRELY new models in the Rabaldo electric dryshave range are being marked shortly by JOHN A. FRANSEN LTD., Northwood, Middx.

Each of these models maintains the exclusive "blade next to skin" shaving principle, i.e. the actual shaving blades operate directly on the skin against a fixed lower blade whilst knurled rollers flatten the skin and ease the hair out of the skin follicle ready for shaving below skin level. There is no outer guard to prevent skin close shaving. Yet no special technique is required to be learnt.

The models are the Rabaldo Multi-Ras four bladed Model No. 1, 200-250 V a.c. or d.c. and for other special voltages, to retail at £8 15s. plus £2 7s. 9d. tax, and No. 2 as above but adjustable for all voltages between 100-250 V a.c. or d.c. which retails at £9 15s. plus £2 12s. 9d. tax, and the Rabaldo Dual-Ras, which has twin blades and is for operation on 200-250 V a.c. or d.c., and costs £6 15s. plus £1 15s. 7d. tax.

All models have cream coloured plastic bodies and all carry 12 months written guarantee.

The Dual-Ras is packed in an ivory plastic case whilst the Multi-Ras models are supplied in a handsome leatherette case, and all are supplied with cleaning brushes and instruction books.

## A Three Position Toggle Switch

IN answer to a widespread demand, ARCOLECTRIC (SWITCHES), LTD., Central Avenue, West Molesey, Surrey, have designed and introduced a three-position toggle switch with true Q.M.B. action.

Each position of the switch is obtained with positive snap action. The switch itself is provided with six terminals for connections and will switch three separate single-pole circuits or alternatively it will control two circuits, the end or central position being "off" position.

The contacts are of the self-cleaning, low-resistance type. Catalogue No. M.40, the switch is rated 5 amps, 250 V, a.c./d.c., and is listed at 6s. 8d. each. Fixing is by means of two inserts lapped 6 B.A. at 1¼ in. centres.

Readers will note many applications for this switch for controlling small motors at two speeds and off and certain types of element for two "heats" and off.

# TRADE PUBLICATIONS

ALUMINIUM.—A periodical issued by the Aluminium Development Association, 33 Grosvenor Street, London W.1, entitled "Aluminium Courier", surveys in each different issue an entirely different application of the metal. Most recent issue, No. 17, deals with Applications for Packaging; next month deals with Horticulture.

LIGHTING EQUIPMENT.—Dispersive lighting reflectors manufactured by Simplex Electric Co., Ltd. Oldbury, Birmingham, are described in a recent catalogue section issued.

CONTROL DIAGRAMS.—Standard Telephones and Cables Ltd., Oakleigh Road, New Southgate, London N.11, are specialists in the design and supply of mosaic diagrams which meet the demand for a simple flexible control room indication diagram. A new brochure just issued describes the system.

INSTRUMENT MANUFACTURE.—A new publication by the English Electric Co., Ltd., Queens House, Kingsway, W.C.2, illustrates some of the processes involved in the production of meters and instruments at the company's Stafford works.

WELDING.—Following the introduction of their pipe welding (and molybdenum bearing) electrodes, the Quasi-Arc Co., Ltd., Bilston, Staffordshire, have issued an eight-page technical circular giving details of mechanical and chemical properties, welding technique and other applications and characteristics of these electrodes.

CONSTRUCTION STRIP.—"Dexion News", issued by Dexion Ltd., 189 Regent St., London W.1, deals with the application of this patented alloy construction strip in permanent and temporary structures.

CHEMICALS FOR PLASTICS.—A well produced coloured brochure issued by Monsanto Chemicals Ltd., Victoria Station House, S.W.1, provides adequate publicity in support of "Lustrex", the company's improved polystyrene.

LAMPS.—A new 28-page general lamp catalogue is now being distributed to the trade by the Stella Lamp Co., Ltd., 37-39 Oxford Street, London W.1.

TELEPHONE LINE PROTECTORS.—An attractive new booklet has recently been produced by the Edison Swan Electric Co., Ltd., 155 Charing Cross Road, W.C.2, which features the properties of Ediswan telephone line protectors.

FLAMEPROOF GEAR.—Bolted flameproof cable couplers produced by British Insulated Callenders Cables, Ltd., Norfolk House, Norfolk Street, London W.C.2, are illustrated in a new publication Number 310.

LIGHTING.—New Linolite literature available includes Reflector Leaflet R8, illustrating a complete range of reflectors for filament tubular lamps, and Sign Leaflet S9, which gives further details of the "Linoglas" internal reflection sign and describes the useful small box direction sign made by Linolite, Ltd., 118 Baker Street, London W.1.

ADHESIVES.—"Strip heating," a paper by Parc Lacey, B.SC.(Eng.), D.I.C., A.M.I.CHEM.E., formerly of Forest Products Research Laboratory, is the main feature of Aero Research Technical Notes No. 109, issued by Aero Research, Ltd., Duxford, Cambridge. It features the applications of electricity in the jointing of woods with glue and resinous adhesives.

# A PLAN FOR CAPE TOWN

*From our Special Correspondent*

CONSIDERABLE expansion and development of Cape Town's municipal electricity supply to provide for increasing demands for supplies of current is contemplated in the near future and as a preliminary, at the request of the City Council, their consulting engineers in England, Messrs. Merz and McLellan, are now engaged on the preparation of a comprehensive report on developing the undertaking to cater for those demands. The report will probably be completed within two or three months. The consulting engineers have also been asked to send out one of their principals to obtain first-hand information.

The City Council has two stations in operation. The older, Dock Road station, went into commission in 1904, but, as the city expanded chiefly by the inclusion within its boundaries of surrounding municipalities, it became necessary to construct another power station which, known as Table Bay station, was put into commission in 1939. For some years the City Council's two stations and the Electricity Supply Commission's Salt River station, which began to operate in 1928, have pooled their output, but in 1957 this pooling arrangement comes to an end.

## The New Site

In recent years an extensive land reclamation, scheme has taken place in the area of the docks and this is now about to be developed to afford an imposing entrance to the city. As part of this development, the Dock Road station is ultimately to be demolished, but, as it houses transformers and e.h.t. switchgear supplying the central area and other important sections, this cannot be accomplished until alternative arrangements are available, such as by the provision of one or more major substations from which current can be distributed to the area already mentioned and for the foreshore extension itself. In addition, the site boundaries of the Table Bay station will require re-orientation to conform to the requirements of the foreshore scheme, including the making of extensive alterations to the reserve coal store and the coal handling and crushing plant, not to mention the railway sidings over which coal is supplied to this station.

## Transmission

Consideration must also be given to major extensions to the transmission system, which should be completed within the next six years to meet the growth in the southern suburbs and to such alterations to the 33 kV transmission and 12 kV distribution circuits from Salt River power station as may be necessary as the result of the cessation of the pooling agreement with the Electricity Supply Commission in 1957. The construction of an entirely new power station in the suburban area of the city proper is also being considered. The proposal is that this power station should be available by 1959 at the latest. Being inland, away from the sea, it would have to be a "cooling tower" power station, and the idea is to have it as close as possible to the city's sewage disposal works from which clarified sewage effluent could be obtained for condenser cooling water purposes in conjunction with the cooling towers.

These are among the more important matters on which the consulting engineers are to be asked to report in connection with the development of the undertaking as well as proposals for ensuring that modern techniques and practice are employed. An expenditure of something like £10 million is envisaged to carry out such an expansion and development plan.

In conjunction with these plans official discussions have taken place to ensure that adequate supplies of coal will be available when the new station is operating. It will be recalled that in recent winters, the fuel stocks position at Cape Town dropped to a critical figure.

## NEW RESISTANCE ALLOY

FURTHER information is now available about the new alloy with a high resistivity and a low and stable temperature coefficient, recently announced by British Driver-Harris Co., Ltd., of Manchester. It has extremely interesting possibilities in resistor manufacture.

This nickel chromium alloy gives the following values: resistivity of 800 ohms per circular mil-foot; temperature coefficient of $+0{\cdot}00002$ per degree C. from $-50^\circ$ C. to $100^\circ$ C.

The higher ohmic values of this new alloy, "Karma," make it possible for even smaller precision resistors to be wound at a still lower cost per ohm. The more stable resistance of the alloy permits wider applications at extended temperature ranges; its low thermal e.m.f. value, compared with that of copper-base alloys, gives an assurance of extreme accuracy, and its superior resistance to oxidation prolongs its electrical properties. The higher tensile strength permits faster winding speeds and its lower thermal expansion minimises distortion and movement in windings.

"Karma" can be soldered, brazed or welded, and arrangements are being made to supply it with the conventional insulations such as enamel and fabric coverings. It is available in wire sizes down to 0·001 in. diameter.

The manufacturers invite those interested to communicate with their technical department.

# THE WEEK

## COMMERCE *in news* INDUSTRY

### *Lighting Ban to Remain*

THE appeal by the Electrical Sign Manufacturers' Association requesting a reduction in the restricted period during which electricity from the mains may not be used for advertising purposes, has been rejected by the Minister of Fuel and Power. As reported in our January 31 issue, E.S.M.A. suggested that the period should end at 1 p.m. in view of the considerably improved position as regards electricity supplies. At present the use of public supplies is prohibited between 7 a.m. and 7 p.m. on Mondays to Fridays, except for the very small signs.

An alternative suggestion that restrictions should end at 5.30 p.m., a relaxation which occurred in 1950, was also rejected. We understand that no reasons were given for the refusals. Commenting on the Minister's decision, E.S.M.A. secretary, Mr. B. Moss, said he felt present restrictions could have been relaxed some time ago. Members found consolation, however, in the fact that on April 4 all restrictions would be removed, possibly for ever, he said.

### *Protests on Rural Electrification*

REPORTS continue to reach us from various parts of the country concerning the opinions of sundry organisations on rural electrification. A set of constructive proposals designed to expedite the rural electrification of the Fens was included in the report of the electricity sub-committee of the Isle of Ely's N.F.U. Among the recommendations made was a request to local branches to investigate the extent of the lack of progress so far, and to prepare schemes showing the possible link of farms and the difficulties of priority in connection. The branch maintains the Isle has been sadly neglected in this field, as work done to date compares unfavourably with other counties in E. Anglia.

### *The First Half Century*

Last week I called on Mr. Gavey at the G.P.O., with the object of finding out when the ELECTRICAL TIMES would be blessed with a Post Office telephone on its premises. Mr. Gavey could not say precisely, but he made no question that most subscribers in the central district who had applied so far would be connected in the course of a month, and that the junction with the N.T.C. would be completed within a week.—*From our issue of February* 20, 1902.

A resolution has been passed by Penrith branch of the Union protesting against the halting of capital works on rural electrification. Concern has also been expressed by West Fife farmers, who are to ask the S.E. Scotland Electricity Board to hasten the installation of power on farms. At a meeting of the Stone branch of N.F.U., it was stated that capital allocation had been the chief restricting factor in rural expansion, and in consequence, areas had to be found where there was a concentrated demand.

### *Machinery Trades' Convention*

THE third annual convention of the Association of Electrical Machinery Trades is scheduled to take place at the Chateau Impney, Droitwich Spa, on April 21 and 22. There will be two papers—the first on the Monday afternoon entitled "Design of Motors," and the second on the following morning which will be "Developments in Electronic Control of Motors." Other events planned are the council meeting on the first morning, dinner and concert the same evening and some form of relaxation as a finale which is expected to be either a visit to the Shakespeare Memorial Theatre or a golf tournament. We understand that accommodation is limited and the Association's secretary at 100 Park St., W.1, would welcome early applications.

### *Denis Ferranti Meters of Bangor*

READERS may recall that early last year Mr. D. Z. de Ferranti acquired a controlling interest in the Bangor (North Wales) company of British Electric Meters Ltd. It has been announced that this firm will, in future, be called Denis Ferranti Meters Ltd. Before he resigned the general managership of Ferranti Ltd., Hollinwood, Mr. de Ferranti was a specialist in meters in all phases of design, production and sales. In this he followed and furthered the work begun by his late father Dr. S. Z. de Ferranti.

### *F.B.I. comments on Trading Profits*

EVIDENCE under consideration by the Royal Commission on Taxation of Profits and Income includes that submitted to the Millard Tucker Committee on the Computation of Trading Profits for Taxation Purposes. In his budget statement last year, the Chancellor of the Exchequer said that before taking any action on the Millard Tucker Report, it would be necessary to await industry's reaction, and it is with this in mind that the F.B.I. has just issued its comments on the Report. Among its contents the memorandum

discusses the problem of assessment on the current year's profits and refers to the effects of inflation on taxable profits. It has been submitted to the Chancellor, the Royal Commission and to the Board of Inland Revenue.

### *Colombo Exhibition Postponed*

IT was announced in London last week that the Colombo Plan Exhibition has been postponed until Saturday (February 23) owing to the tragic death of H.M. the King. The official opening ceremony was to have been performed by H.M. the Queen last Saturday while she was on her way to Australia. The ceremony will now be performed by Lord Soulbury, Governor-General of Ceylon.

### *Upkeep of Cookers is Costly*

CONCERN was expressed at last week's meeting of the Burgess Hill (Sussex) U.D.C. over the fact that in just under two years 77 of 127 cookers in houses on the West Park estate had required attention of some kind. Most costly item apparently has been the replacement of hot-plates. It was decided that strict measures would have to be taken to save Council funds and accordingly the matter has been referred to the Council Tenants Association for consideration and suggestions. The Council's own proposal is that in future tenants shall bear the cost of all hot-plate repairs and replacements.

### *Pollution of River Derwent*

THE discharge of heated effluents from Derby power station into the River Derwent was a contributory cause of the destruction of much fish life in the river it was alleged in an action begun in the High Court of Justice last week. The East Midlands Division of the B.E.A. and Derby Corporation are defendants in a claim for injunctions and damages for pollution of the river, brought by the Pride of Derby and Derbyshire Angling Association and the Earl of Harrington as owners of the fishing rights. It was alleged that Derby Corporation had polluted the river by the discharge of insufficiently treated sewage. The Corporation admitted the discharge of effluents but denied that the effect was to pollute the waters.

For the plaintiffs it was stated that in 1945 there were several million fish in the river; today it was devoid of fish life. Derby power station took water for cooling purposes and returned it to the river heated up. As a result, just below the station, and for miles, the river was dead, it was alleged. Carpeted with foul sludge and sewage fungus, it was a river in which fish could not survive or breed. On behalf of the B.E.A., Mr. Salt said they considered their actions mitigated rather than increased the pollution of the river. The Authority were prepared to investigate to see if they could do anything to help the plaintiffs, but it would be expensive and take time. The Authority maintained that they did nothing lethal *per se*, and that they helped the breeding of the fish. But it was admitted that the river was polluted above Burrowash Bridge.

The hearing continues this week.

### *Flexello expand on Slough Estate*

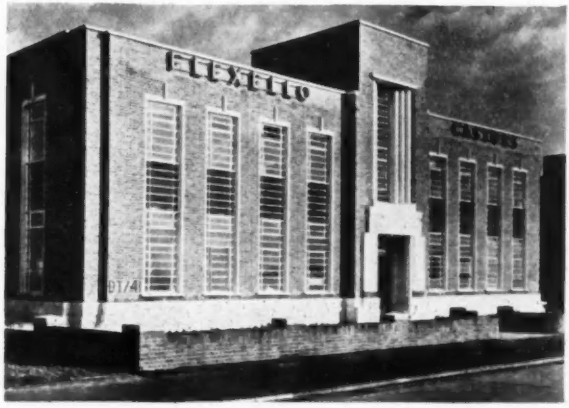
A NEW landmark on the main Bath Road of the Slough trading estate is the recently opened additional factory of Flexello Castors and Wheels Ltd. This new and impressive building houses the main offices, assembly shops, warehouse and loading bays, and the space thus saved in the original factory will undoubtedly provide greater capacity for basic manufacturing processes and raw material stores. The machine shop, now greatly enlarged, has been equipped with modern automatic machines, and new machines are also to be found in the press shop. A recent addition to the plating shop has been equipment for black oxidising process which gives a "gun barrel" finish and, on certain castors, is Flexello's answer to the present restrictions on chromium and nickel.

### *Oldest Catalogue wins Prize*

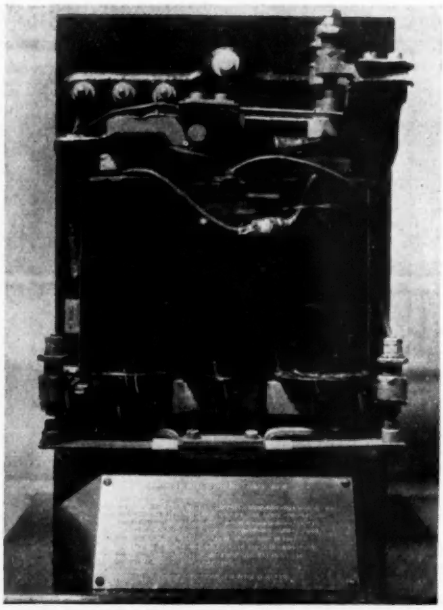
READERS may recall that just before Christmas we referred in these columns to an appeal by M.K. Electric Ltd. for old catalogues. A suitable prize was offered by the company for the oldest catalogue received. There were, we understand, numerous "entries" and we note that the winner was the Export Dept. of F. and C. Osler Ltd., of Birmingham. There is no indication, however, as to whether the sponsors received the one copy which was missing from their records.

### *Spring Course on Illumination*

THE next Illumination Design Course organised by E.L.M.A. is to take place from April 21 to 24. It will be noted that it is to cover four days only,




*The new and impressive factory of Flexello Castors and Wheels Ltd. which was opened recently on the Slough Trading Estate*



*One of Mr. H. G. Brown's polarised d.c. track relays which was presented to the pioneer's son, Mr. Donald Brown, recently. It was among the last to be replaced on London's Underground Railway*

instead of the five normally allocated to the spring course, but this step has been taken as it is felt the shorter duration will be to everyone's advantage, particularly employers. As a result the four days promise to be busy ones, with 28 separate lectures scheduled for inclusion. Broadly, there will be 11 lectures on the basic principles of lighting and lamps, and the remainder will be devoted to individual subjects such as shops, schools, offices and houses.

Invitations are to be despatched to the electrical trade shortly with a copy of the programme, but in the meantime the Association will accept applications to attend.

## *Lighting for Printing*

MAINTAINING the standard of the previous five technical supplements, E.L.M.A. have just published the sixth in the series entitled "Lighting for Printing." It is designed to assist both lighting engineers and printers in the provision of good illumination specially suited to the requirements of the trade and sets about the task methodically. After listing the general principles to be followed and illustrating some examples of bad lighting the pamphlet goes on to deal with particular departments of a printing house—the composing room, machine room, process engraving, retouching, packing and despatch. Diagrams depicting the best position of fittings in relation to the work which has to be done, should be of great value.

Another helpful inclusion is a table giving the recommended values of illumination for printing processes. For example, in the proof reading department the minimum level of illumination required for adequate seeing conditions is given at 20 lumens/ft². Copies of this pamphlet may be obtained on application to E.L.M.A. at the Lighting Service Bureau, 2 Savoy Hill, W.C.2.

## *Track Relay Pioneer Honoured*

TOWARDS the end of 1951 the last of Mr. H. G. Brown's polarised d.c. track relays on London's underground system was removed from service to be replaced by the later a.c. circuits. The "Brown" relays had then been in use for nearly half a century and in recognition of the good service they had performed London Transport has presented one of the last to be removed to the designer's son Mr. Donald Brown, present managing director of the Westinghouse Brake and Signal Co.

The system of using two polarised relays to prevent interference between traction current and track circuits was evolved by Mr. H. G. Brown when he was with the Elevated Railway in Boston, U.S. He later became managing director of Westinghouse and introduced the system on the District Railway in London, from whence it spread to other lines. The first relays were of the 4-core type but a new design of 3-coil polarised relay was produced for power signalling and continued in use until replaced by the modern a.c. track circuits in the late 1920's.

## *Contract for Traction Rectifiers*

IN connection with the re-equipping of various parts of the Southern Region of British Railways, we note that Hackbridge and Hewittic Electric Co. has received an order for the supply of forty-eight 2,500 kW sets of glass bulb rectifiers. These are to be installed in 29 substations having individual capacities of between 2,500 kW and 10,000 kW for feeding the main and suburban traffic lines from Waterloo station to Hampton Court and branch lines to, among other places, Guildford, Staines and Windsor. Incoming supply will be 33 kV and the output to the track 660 V d.c., but provision is to be made for the equipment to operate at 750 V d.c. at a later date.

## OFFICIAL PUBLICATIONS THIS WEEK

RADIO RESEARCH H.M.S.O., 1s. 6d.
*Special report No. 22 by D.S.I.R. on siting of direction finding stations.*

NATIONAL RESEARCH DEVELOPMENT CORPORATION H.M.S.O., 9d.
*Second annual report and accounts, covering year to June 30, 1951.* (*See page 330*).

BRITISH STANDARDS
*B.S.G. 137: Extra-low-voltage d.c. flashing unit for aircraft navigation light systems. B.S.G. 138: Extra low-voltage and low-voltage ram air pressure switches for aircraft.*

RADIO INDUSTRY COUNCIL STANDARDS
*Amendments to various standards.* (*See page 367*)

MIN. OF HOUSING AND LOCAL GOVT. CIRCULAR No. 12/52 H.M.S.O. 2d.,
*Rates of Interest to Local Authorities*

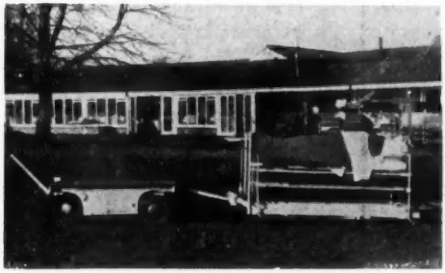
## *Tungsten Lamp has reached Limit*

THE tungsten lamp had just about reached its ultimate in development, said Dr. B. P. Dudding of the G.E.C. research laboratories, at a meeting of the I.E.S. in Cardiff last week. He was speaking on the development of the tungsten lamp and showed the steady improvement which had taken place since the days of the old carbon to the latest coiled-coil filaments. Dr. Dudding told his audience that modern lamps were running at a temperature very close to the melting point of metal, and the future of electric illumination was in the fluorescent tube lighting.

## *Safety in Electricity*

FURTHER information has now become available on the course on "Safety in the Electrical Industry," which is planned for Burton Manor Residential College for Adult Education for the week April 27 to May 2. Preliminary details were given in our issue of November 22. There will be a maximum of 22 resident places and 14 non-resident places, the corresponding fees for students being £4 5s. and £3 5s., including meals. In view of the heavy demand for places a similar course has been planned for April 19 to 24, 1953. There will be 60 places on this course.

Director of studies for the course is Mr. D. A. Picken, the local electrical inspector of factories. The course assembles on a Sunday, and in the evening there is an opening address and introductory talks. Monday is occupied with talks on h.r.c. fuses, electrical accidents, electronics (by Professor E. Williams) and earthing. On Tuesday medical aspects of electricity occupy the attention, with Professor S. Jellinck, from Vienna, lecturing on that subject, and Dr. I. S. Eve opening a discussion on artificial respiration. Dangerous machinery, welding equipment and supplies for electrolytic work are scheduled as Wednesday's talks, and electrostatic effects, protective equipment and the legal aspects of electrical safety, Thursday. On Friday the course will break up after a brief summing-up.



*The uses of the electric battery vehicle are becoming more numerous as the weeks pass. The latest employment given to these small "cars" is at the Rowley Bristow Orthopaedic Hospital, near Woking, Surrey, where two pedestrian-controlled "Roadster" vehicles made by Tomlinson (Electric Vehicles) Ltd., and powered by 24 V Tudor batteries with capacity of 108AH, draw bedridden patients from one building to another. One such move is shown in our illustration*

*Following our note last week on the demonstration of the latest Ekco airfield radio approach aid at Southend airport, the accompanying photograph shows Mr. E. K. Cole, centre, watching Mr. B. Collins, the airport manager, operating the prototype version*

## *Local Council or Ministry?*

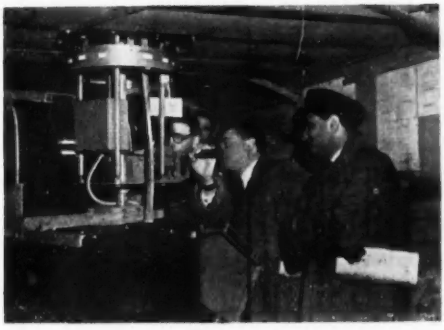
AT the beginning of November last the Ministry of Transport issued a reminder to local authorities concerning street lighting and the need for authorisation of such installations. Last week we learnt of an approach by the Association of Municipal Corporations to the Ministry to elucidate just where the authorities stood as regards proposed schemes. It appears that a fluorescent lighting installation planned by Leamington Spa Council was rejected as being unduly extravagant. In consequence the Minister is to be asked to receive a deputation concerning the power of local councils to decide on street lighting improvements.

## *Standard Mark Compulsory?*

GOODS exported from Ireland may eventually have to be of such a quality that they can bear the "Irish Standard" mark as complying with specifications issued by the Eire Institute of Industrial Research and Standards. This statement was made on Friday by Mr. Sean Lemass, Eire Minister for Industry and Commerce, speaking in Dublin. The object, as put forward by the Minister, is to safeguard the public against inferior articles and help defeat prejudice against Irish goods.

## *Public Speaking*

IN this year's public speaking competition organised by the Electrical Development Association there will be 19 competitors in the national final, ten of whom will be women and nine men. Some of the area results have been announced, accounting for six women and four men finalists. The first



*Nearing completion in the Eregli coal mines of Turkey is possibly one of the largest installations of electrical power and lighting equipment in the mining industry. The scheme, which comprises over 700 flameproof underground mining units and 3,500 flameproof fluorescent lighting fittings, was referred to in these columns last year. Photographs have now been received and we reproduce one here depicting miners at work under the new conditions. In charge of the installation were engineers from the British-Thomson-Houston Co., Ltd., who not only advised on operations but also trained Turkish engineers in the use and maintenance of equipment*

and second prizes in these preliminary contests are £5 and £3 respectively, the first-prize winner representing the area in the national competition. In the finals, the premier trophies are the Faraday Silver Challenge Shields, which are kept by the winners' Area Boards, a replica being presented to the candidates. Last year the men's section of the competition was won by the Merseyside and N. Wales Board, and this year's contest in the women's section will be keenly fought by the Yorkshire Board, who have won the title both in 1950 and 1951. That Board's representative in 1952 has not yet qualified.

## *Sound Recording*

A LARGE audience was present at Westminster Central Hall last week to hear Dr. G. F. Dutton give the Faraday Lecture on "Sound Recording—Home, Professional, Industrial and Scientific Applications." Dr. Dutton began by giving an historical review of the progress of sound recording from the early work of Leon Scott in 1859 to the talking films and high-quality electrical recording of the present time. Magnetic wire and tape recorders were dealt with in considerable detail, and the fidelity and convenience of this type of recorder were demonstrated. Among unusual items was the playing of a recording of the noises in a large railway station which, because of its realism, was much appreciated by the audience.

## *Lamps and Laylights*

MAIN feature of the lighting installation carried out in the new museum of the Zoology Department at the University of Southampton is the incorporation of the scheme with laylights so that conditions at night closely resemble those in the daytime.

*Our illustration shows how fluorescent lamps incorporated with laylights provide general lighting in the new Zoology Dept. at the University of Southampton*

Four rows of six trough reflectors with 8 ft 125 W natural fluorescent lamps, mounted in continuous lines, are arranged above the laylight in the main hall. They are positioned to obstruct the entry of daylight as little as possible, and to ensure that when the lamps are in use the sloping side panels of the laylight are uniformly and completely flashed. Additional lighting is also provided by further lamps in batten fittings, giving higher illumination over display cases. There are also angular laylights for directional lighting of showcases in the gallery and, at night, similar directional lighting is provided by 5 ft 80 W fluorescent lamps in 16 angle-type one-lamp trough reflectors inside the laylight. All the fittings for this scheme and other rooms at the University were supplied by the G.E.C., and the installation was carried out by F. W. Cook and Co. (Southampton) Ltd.

## *Atomic Electricity in 1992?*

IN the course of his talk on atomic energy at the headquarters of the North Western Division of B.E.A. last week, Sir Christopher Hinton said it would be between 30 and 40 years before atomic energy would contribute towards the country's

resources for electrical generation purposes. He was speaking to engineers invited from nationalised industries.

The real future in atomic power production, Sir Christopher felt, lay in the development of a fast reactor using a pure fissile material and in which neutron bombardment could be accelerated. Although this could create heat transfer difficulties at high temperatures, the main problems were metallurgical and chemical. He described simply the fundamentals of production of atomic energy, and added it was a great mistake to think the subject a difficult one to understand—as many people as possible should be interested.

### *R.I.C. Standards*

A SERIES of minor amendments to the specifications published by the Radio Industry Council have recently been issued. All the amendments are dated January, 1952, and they cover standards R.I.C./111-113, 122, 131-134, 136, 137, 141-143, 214, 321, 322 and 1000/c.

### *The G.P.O. in 1951*

APART from any business reasons, the Review of Post Office Activities during 1951, just published, makes interesting reading merely for interest's sake. The serious side of the G.P.O., facts and figures on sales of stamps, transmission of telegrams, telephone connections, supplies and stores and accounts, are dealt with first, and, these completed, the book goes on to depict the more romantic side of life. Trunk calls, the 999 system and the story of telegraph ships are among the articles included. Published by H.M.S.O., price of the book is 3/-.

## *NEWS IN BRIEF*

Following postponement owing to the death of H.M. the King, the second National Power Farming Conference has now been fixed for March 11, 12 and 13. Programme remains unchanged.

A full list of commodities which may be imported without restriction into Germany from all O.E.E.C. was given in last Saturday's *Board of Trade Journal*.

The third productivity team to leave these shores within a week sailed for America on Tuesday to study retail distribution.

A contract worth £90,000 for a high-power broadcasting installation has been placed by Danish Directorate General of Posts and Telegraphs with Marconi's Wireless Telegraph Co., Ltd. The new station is expected to be opened in Kalundborg at the end of next year.

A special exhibition—London, the Next 20 Years—opened last Saturday for six weeks at the County Hall, London. It deals with the London Development Plan, 1951.

Two special programmes of international scientific films will be presented by the International Committee of Scientific Film Association at Institut Francais, Queensbury Place, S.W.7, on March 20 and 22. The second includes "Etude de l'Arc Electrique" (a high-speed study of the electric arc).

Methods of ensuring the greatest efficiency in the use of the country's manpower will be discussed at "Human Relations in Industry" conference which Ministry of Labour and National Service is holding between March 18 and 20.

# *Questions in Parliament*

**Capital Development**

Expenditure on capital development by the B.E.A. and area boards in 1951 was approximately £140 million, stated the Minister of Fuel and Power in a written answer last week. This figure compared with about £30 million by the Coal Board and £40 million by Area Gas Boards. As regards the sums authorised for capital development during 1952, the Minister said it was not possible to make an accurate forecast. The Chancellor of the Exchequer had stated, however, that the fuel and power industries would be protected as far as possible from cuts in capital investment in the coming year and it was expected therefore that expenditure during 1952 would not vary much from that of 1951.

**Expense Allowances for Boards**

A number of questions were asked last week concerning expense allowances to public boards. Among them Mr. J. Morrison asked on what grounds it was decided that these allowances for the North of Scotland H.-E. Board should be granted for the Board as a whole and not to individual members. He also sought a similar answer in respect of the B.E.A. and each of the area boards. The Financial Secretary to the Treasury stated that in each case the arrangements were made as a matter of administrative convenience.

**Generating Costs**

Mr. Nabarro asked the capital cost of providing new hydro-generating plant on the North of Scotland and B.E.A. systems. Mr. Lloyd replied that he had been informed by the Secretary of State for Scotland that the Loch Sloy scheme, designed to operate as a peak-load station at a load factor of 10½%, cost £81,000 per megawatt, and the Tummel-Garry, Fannich and Affric schemes, working at an average load factor of 35% were built at an average cost of £136,000. He added that these costs were incurred over a number of years and it would not be possible to relate them to present prices.

The Minister also stated he was informed by the B.E.A. that the designed load factor of proposed N. Wales schemes was about 18% and the average estimated cost was £100,000 per megawa

# *Electric Supply News*

**Carlisle**

The Corporation last week decided to continue to resist the British Electricity Authority in the latter's claim for certain assets stated to be of the former city electricity undertaking. It was reported that the B.E.A. had issued a writ against the Corporation seeking the transfer to them of certain assets. Earlier the Authority, in a letter, had suggested a compromise settlement, or, alternatively, a reference to the Minister of Housing and Local Government. The letter further stated that the substance of the Authority's claim was that over a period of nearly 30 years the Corporation had charged to the revenue account of their former electricity undertaking income tax payable on the profits of the undertaking without setting against that liability income tax deducted from interest and other annual payments of the undertaking, and that the accumulated sum of the excess amounts so charged to the undertaking were held by the Corporation at vesting day. The town clerk had sought independent legal opinion which had advised that the claim should be resisted. After consideration of the matter the Finance Committee recommended that it be given full authority to deal with the claim, and to take such legal or other advice as may be deemed necessary, including the engagement of counsel to resist in the High Court any further steps that may be taken against the Corporation. This was approved.

**Cowes**

The B.E.A. has applied for M.o.T. formal consent to the construction of works in connection with the generating station at Cowes, on the east bank of the River Medina.

**Londonderry**

Consumers are no doubt pleased at the report presented last week by the city electrical engineer, Mr. R. V. Macrory, to the Electricity Committee. In this he estimated that notwithstanding the increases in the cost of coal it was anticipated that on March 31, 1953, there would be a small surplus of revenue over expenditure. It was unnecessary at present, therefore, to increase charges to consumers of current. Mr. Macrory added that the Electricity Board for Northern Ireland had proposed an increase in their basic rates of about 10%, and Belfast were also considering a rise.

**Salisbury**

The City Council recently discussed the question of whether to install gas or electric cookers and washboilers in 350 houses at Bemerton Heath Estate. The city engineer submitted a report showing that the total estimated cost of installation of electrical appliances was £11,760, and for gas apparatus £8,773. To the latter figure, however, must be added £3,000 being the capital contribution payable to the Southern Electricity Board in respect of laying mains for electric lighting. The total comparative costs were, therefore, electric appliances £11,760, with gas apparatus £11,773. The Council decided that gas cookers and washboilers should be installed. One member pointed out that the Housing Committee felt strongly that as the total capital expenditure was practically the same, both gas and electricity should be installed for the following reasons: That although the tenant on entering into occupation would find gas cookers and gas coppers installed, he would, if he desired and at his own cost, be able to install an electric cooker, etc.; to this extent it allowed the tenants to choose.

**Yorkshire**

It is expected that the Yorkshire Electricity Board will shortly announce new standardised tariffs. At present there are about 600 different methods of charge or tariffs in operation in the area, and as a preliminary to the introduction of standard tariffs it is necessary that supply agreements are terminated. This the Board is now doing by sending notices to all consumers, giving a termination date of June 14. Thereafter any changes will be notified by public announcement.

## LIGHTING SCHEMES

**Cuckfield.**—U.D.C. has approved the conversion from gas to electricity of street lighting in Haywards Heath, Cuckfield and Lindfield, at a cost of £4,500.

**Northampton.** — The Highways Committee recommends approval of a revised scheme for the conversion of street lighting from gas to electricity at an estimated cost of £43,383. This scheme calls for lighting of A and B roads based on a quotation of the East Midlands Electricity Board. The town centre lighting by fluorescent lamps would not be affected.

**Oxford.**—The Highways, Sewers and Lighting Committee is to investigate a proposal for the conversion of street lighting from gas to electricity.

**Salford.**—In the plan to overhaul the street-lighting system, the Finance Committee is to be asked to approve a Street Lighting Committee estimate of £71,600, an increase of £20,000 on the current year.

**Spenborough.**—The Street Lighting Committee will consider at their next meeting the conversion of further lighting from gas to electricity.

**Wandsworth.**—B.C. recommended to approve in principle the installation of sodium lighting in two main routes through the borough, Brixton Hill and Clapham Road, at a cost of £25,755.

**Wigston.**—Scheme to be submitted to M.o.T. for conversion of street lighting from gas to electricity. More than 400 gas lamps are involved.

**Woolwich.**—B.C. recommended to approve a scheme for re-lighting of Westmount Road and Westmount Place, at a cost of £6,000.

# Company Activities

**Andhra Valley Power Co.**

The net profit for the year to June 30 is Rs. 20,96,838 (*Rs. 25,51,432*), less dividends including Ordinary of Rs. 30. To tax reserve Rs. 1,14,000 (*nil*), contingencies Rs. 1,29,964 (*Rs. 2,56,500*), depreciation arrears Rs. 1,26,802 (*nil*), off tangible assets nil (*Rs. 35,605*), to general reserve nil (*Rs. 2,40,000*), dividend reserve Rs. 10,00,000 (*Rs. 13,30,000*), carried forward Rs. 26,827 (*Rs. 23,252*). There is a Preference dividend of 7% for the half year to June, and final on Ordinary of Rs. 45 per share, from the dividend reserve.

**Brush Electrical Engineering Co.**

The company, which already holds all the issued Ordinary capital of the National Gas and Oil Engine Co., is now offering an exchange into its own Preference shares to holders of the 600,000 £1 Preference shares of National. The basis of the offer is 11 Brush shares for every 10 National shares. Brush are also taking the opportunity to reorganise its Preference capital, which, while preserving the value of the existing Preference stock, will enable the company in the future to raise further Preference share capital. Meetings are called for March 11.

**General Electric Co., Ltd.**

The new issue announced last week conformed to most expectations. Stockholders registered at January 31 are offered two new £1 Ordinary shares at 72s. 6d. each for every £5 of Ordinary stock held. A total of 1,679,348 shares will be allotted and the issue will produce a net amount of approximately £5,960,000. Underwriting is being undertaken by Morgan Grenfell and Co. The directors have also announced an interim dividend of 7½%. (The new shares will not be eligible for this interim.) The final distribution for the year to March 31, the directors state, is expected to be 15% on the increased capital. Since pre-war years the Ordinary dividend has been 10% plus a bonus which last year was raised to 12½% after ten years at 7½%. As this is the first interim dividend ever paid by the company stockholders are naturally interested to know whether it is intended to make interim distributions in future years. Regarding the need for further capital, the board points out that since the £8,000,000 issue of 3½% Unsecured Loan stock 1954-59 in July, 1949, the demand for the company's products has increased in practically every field. Moreover, the commitments under the defence programme are growing daily.

**Hoover, Ltd.**

Before arriving at the consolidated profit of £3,014,894 (*£2,475,271*) as we reported last week, the sum of £514,000 (*£389,000*) was deducted for depreciation, which Sir Charles Colston, in his review of the firm's activities, considers adequate having regard to high replacement costs at the present time. Following revaluation of the fixed assets, their book value has been increased by £1,510,000, and this has been transferred to capital reserves. There is £133,000 transferred to general reserves, and £157,000 to employees' superannuation schemes. After providing for dividends, the carry forward is increased to £932,000 (*£413,000*). The year 1951 was again a record for the company, but expansion took place in the export market. Exports were about 2¼ times those of 1950. About 70% of washing machine production, more than 80% of f.h.p. motors, nearly 40% of electric cleaners, and the whole of the electric polishers made were sent abroad. The company exported nearly 50% more cleaners and 50% more electrical washing machines than all other British manufacturers combined, Sir Charles claims. Remarkable progress has been made in Australia and South Africa, but in New Zealand the rigid restrictions on the import of cleaners and washing machines is a severe handicap. Efforts are being made to expand sales in Canada, where cleaner and washing machine parts are sent for assembly. There has been a useful increase in exports to the U.S., chiefly of the "Dustette," but developments are in train which it is hoped will lead to a substantial rise in the firm's exports to that market.

**Tata Power Co.**

For the year to June 30, the net profit is Rs. 45,43,660 (*Rs. 48,31,905*), less dividends, including Rs. 25 on Ordinary stock. To taxation reserve Rs. 1,98,000 (*nil*), contingencies Rs. 1,91,179 (*Rs. 3,65,536*), depreciation arrears Rs. 9,567 (*nil*), off tangible assets Rs 60,058 (*Rs. 24,077*), to general reserve Rs. 8,50,000 (*Rs. 13,40,000*), dividend reserve Rs. 21,53,000 (*Rs. 20,50,000*), and carried forward is Rs. 33,919. Recommended is a dividend of 7½% for half year to June 30 on the Preference and final on Ordinary Rs. 50 per share from dividend reserve.

**Waygood-Otis Ltd.**

The profit for 1951 is £298,780 (*£378,196*), from which taxation of £130,000 (*£160,000*) is deducted. There is a final Ordinary dividend of 25% (*15%*) making 55% (*45%*) for the year. During the year the sale was completed of the company's shareholding in a subsidiary to the Otis Elevator Co. The transaction resulted in a realised excess over book value of £306,002, which has been added to capital reserves.

**Dividends Declared**

*George Cohen Sons and Co.*—Interim of 8% (*same*).

*Hilger and Watts.*—Dividend of 7½% (*same*). Net profit is £37,118 (*£35,373*).

*International Combustion (Holdings).*—Final dividend of 17½%, making 25%. Group net profit is £545,189 (*£376,235*).

*Taylor Tunnicliff (Electrical Industries).*—Dividend of 20% (*same*).

# Commercial Information

## CONTRACTS OPEN

### HOME

**Feb. 22.—Harrow U.D.C.** Supply and installation of 227 140 W sodium lanterns, lamps and control gear in Group A. Council's Engineer, J. H. Melville Richards, Council Offices, Uxbridge Rd., Stanmore. Deposit £2.

**Feb. 22.—Sunderland.** Electrical installation at St. Cuthberts junior and infants' school, Grindon. Architects, Matkin and Hawkins, Barclays Bank Chambers, Fawcett St. Deposit £1 1s.

**Feb. 25.—Bathgate T.C.** Installation of fluorescent and sodium lighting along main roads and shopping streets. Burgh Surveyor, 2 George Place, Bathgate.

**Feb. 25.—Belfast.** Electrical work in 82 dwellings at Carnmoney and 20 at Portavogie for N. Ireland Trust. Documents from Trust at 12 Hope Street. Deposit 10s. for each scheme.

**Feb. 25.—Fife.** Electrical installation in extension to Buckhaven mining school. Quantity Surveyors are James Gentles and Son, Central Chambers, Kirkcaldy.

**Feb. 25.—Gateshead T.C.** Electrical installation at St. Cuthbert's School in Derwentwater Rd. Chief Architect, Municipal Buildings, Swinburne St. Deposit £2 2s. (See Feb. 7 issue.)

**Feb. 25.—Hastings T.C.** Rewiring of electrical installation at Clive Vale secondary school. Borough Engineer, 37 Wellington Sq. Deposit £2 2s.

**Feb. 25.—Herne Bay U.D.C.** Supply and installation of two electrically-driven sewage pumping units each of 500 g.p.m. capacity, with switchgear, etc. W. W. Smith, Engineer and Surveyor, Council Offices. Deposit £2 2s.

**Feb. 25.—Luton T.C.** Tenders invited for effecting conversion to sodium lighting in several streets, including erection of concrete columns and fitting and wiring of lanterns and equipment. Borough Engineer's Office, Town Hall. Deposit £2 2s.

**Feb. 25.—Southend-on-Sea T.C.** Supply and installation of cables and switchgear to two new electric pumps at sewage disposal works, Prittlewell. Borough Engineer and Surveyor, Municipal Buildings, Clarence Rd. Deposit £2.

**Feb. 25.—Stockport.** Electrical installation extensions to Buckhaven Mining School. Quantity Surveyor, James Gentles and Son, Central Chambers, Kirkcaldy.

**Feb. 25.—Tynemouth T.C.** Supplies required of electric lamps and cables, and lamp columns and reflectors for year ending March 31, 1953. Borough Surveyor, D. M. O'herlihy, 16 Northumberland Sq., North Shields.

**Feb. 25.—Wanstead and Woodford T.C.** Installation of 250 W mercury vapour lighting in St. Barnabas Rd. and Latchett Rd. Work includes supply of 39 columns and lanterns with services and control gear. Borough Engineer and Surveyor, Municipal Offices, High Rd., E.18. Deposit £2. (See Feb. 14 issue.)

**Feb. 25.—Warrington T.C.** Rewiring of Central Police Station in Arpley St. Borough Surveyor, Town Hall.

**Feb. 25.—West Riding.** Installation of electricity at Batley Purlwell Lane and Ossett Gawthorpe schools. County Architect, "Bishopgarth," Westfield Rd., Wakefield.

**Feb. 26.—Towcester (Northants) P.C.** Supply and installation of 28 fluorescent street lighting units to Group A on trunk road A.5. A. E. G. Kemsley, Clerk of Council, 5 Burcote Way. (See Jan. 31 issue.)

**Feb. 27.—Denbighshire.** Electrical installation in primary school at Abergele. Names to G. D. Wiles, County Architect, Grove Park, Wrexham, by above date. Deposit £3 3s. (Advertised in this issue.)

**Feb. 27.—Dublin.** Supply of 5,510 lineal ft. of unarmoured served lead covered paper insulated cable, 660V, for Port and Docks Board. R. F. Lowe is Board's Secretary.

**Feb. 27.—Macclesfield T.C.** Supply and erection of 47 sodium lighting units in Class B mounted on concrete columns. J. S. Dossett, Borough Engineer, Town Hall. Deposit £2 2s. (See Feb. 14 issue.)

**Feb. 27.—Tynemouth T.C.** Supply and erection of four electrically operated pumping units, each of 1,300 g.p.m., at Mitford. Water Engineer and Manager, 8 Northumberland Sq., North Shields. Deposit £3 3s.

**Feb. 28.—Carlisle T.C.** Complete electrical installations in 120 houses. City Engineer and Surveyor, 18 Fisher St.

**Feb. 28.—Dewsbury T.C.** Supply of electric lamps, cable, lanterns, lighting columns. C. H. Midson, Street Lighting Engineer, 27 Baltye St. (See Jan. 24 issue.)

**Feb. 29.—Liverpool.** Supply of two 40-ton six-coupled diesel locomotives to Kirkby trading estate. City Engineer and Surveyor, Municipal Buildings, Dale St.

**Mar. 1.—Bridgwater T.C.** Supply and installation of two electrically driven pumps. Borough Engineer, Town Hall. Deposit £2 2s.

**Mar. 1.—Dundalk U.D.C.** Supply and installation of certain sewage pumping machinery, electric motors, switches, meter and ancillary equipment. J. A. Smyth, Town Clerk, Town Hall. Deposit £5 5s.

**Mar. 1.—Horwich (Lancs) U.D.C.** Supplies of tungsten and sodium lamps required during year ending Mar. 31, 1952. Tenders to T. Roseve, Clerk of Council, Council Offices.

**Mar. 3.—Cheadle and Gatley U.D.C.** Supply of concrete and cast iron lighting columns, lamps, lanterns, swan-neck brackets, and switching gear boxes for year ending Mar. 31, 1953. Duncan S. Graham, Engineer and Surveyor, Town Hall, Brentwood, Cheadle. (See Feb. 14 issue.)

**Mar. 3.—Musselburgh T.C.** Erection of (a) 20 lamp standards and installation of sodium lamps in Campie Rd. and Market St., and (b) 7 lamp standards with mercury discharge lamps in Market St. Applications by above date to Burgh Surveyor, Municipal Offices, High St.

**Mar. 3.—West Riding.** Electrical installation at Hatfield Dunscroft school. County Architect, "Bishopgarth," Westfield Rd., Wakefield.

**Mar. 3.—Westhoughton U.D.C.** Supply of electric lamps required for year ending Mar. 31, 1953. F. H. Walker, Surveyor, Town Hall.

**Mar. 5.—Hebburn U.D.C.** Tenders invited for undertaking repair of electrical installations in council houses. T. Meadows Wright, Clerk of Council, Council Offices, Argyle St.

**Mar. 6.—Basingstoke.** Supply of electric lamps for six months beginning April, required by Park Prewett Group Hospital Management Committee, Basingstoke. Documents from secretary, Fredk. Hales.

**Mar. 8. — Banbridge (Down) R.D.C.** Lighting installations in 48 houses on four sites of 12 each. D. W. Chambers, architect, Town Hall. Deposit £2 2s.

**Mar. 10.—Newcastle-on-Tyne.** Supply, laying and jointing of electric cables at Tyne Dock, South Shields, for Tyne Improvement Commission. Documents from Commission's secretary, J. K. McKendrick, Bewick St., Newcastle. Deposit £1 1s. (Advertised in this issue.)

**Mar. 10.—Whittingham.** Hospital Management Committee (near Preston) require supply of electric lamps for year ending Mar. 31, 1953. Secretary of Committee is W. A. Higgs.

**Mar. 11.—East Riding.** Installation of electrical services at Withernsea secondary school. Applications to County Architect, County Hall, Beverley. (See Jan. 24 issue.)

**Mar. 22.—Kildare.** Supply and installation of two direct drive electrically propelled pumps, including wiring, starters, switches, etc. Consulting Engineer, Nicholas O'Dwyer, 6 Burlington Rd., Dublin. Deposit £5 5s.

**No date stated.—Hastings T.C.** Electrical installations in 16 bungalows at Hollington. Documents from Borough Engineer, 37 Wellington Sq. Deposit £2 2s.

**No date stated.—Leven T.C.** Electrical work in erection of shops and flats on Mountfleurie site. A. D. Haxton and Watson, 5 Scovine Pl., and L. A. Rolland, Albion House, Shorehead, are joint architects and quantity surveyors.

## OVERSEAS

*Details of items marked* may be obtained on application to Room 1076, Board of Trade, Thames House, North Millbank, S.W.1, quoting reference.*

**Nigeria.** Specifications being prepared and tenders shortly to be invited for supply and erection of 132 kV transmission lines between Ibadan and Lagos (90 miles) and Enugu and a new power station (70 miles). Preliminary enquiries to Secretary-Manager, Electricity Corpn. of Nigeria, Lagos, or to Liaison Officer, Electricity Corpn. of Nigeria, The Corner House, Gt. Peter St., London S.W.1. (Advertised in this issue.)

**Mar. 5.—Egypt.** Supply of 60 transformers of 300 kVA output, 40 of 450 kVA and 10 of 400 kVA, for Cairo Electricity and Gas Administration. Specifications available from Chief Inspecting Engineer, Egyptian Govt., 41 Tothill St., S.W.1. Deposit £2 1s. (Advertised in this issue.)

**Mar. 13.—New Zealand.** Supply of several thousand feet of electrical conduit for Post Office Stores Division. Contract No. is P. and T. 150/5197.

**Mar. 14.—Ceylon.** Acting Director of Industries, Colombo, requires supply of Veneer slicing machine and auxiliary equipment for Government Plywood Factory, Guitota. All plant shall be suitable for 400 V 3-phase 50 c/s. B.o.T. (Ref. CRE 3378/52).*

**Mar. 20.—India.** Director General of Industries and Supplies, Shahjahan Rd., New Delhi, invites tenders for one 50-ton manually operated, and two 150-ton motor operated overhead travelling cranes. B.o.T. (Ref. CRE 4291/52).*

**Mar. 29.—Portugal.** Supply and erection of electro-mechanical equipment required for power stations of hydro-electrical and hydro-agricultural schemes of Island of Teceira (Azores). Directorate General of Hydraulic Services, Rua de S. Memede, Lisbon. B.o.T. (Ref. CRE 4056/52).*

**Mar. 31.—Portuguese E. Africa.** Supply of miscellaneous equipment for Bissau—including two diesel engines, two alternators, distribution board and cables—for Bissau Municipal Chamber. B.o.T. (Ref. CRE 4043/52).*

**June 3.—New Zealand.** State Hydro-Electric Dept. invites tenders for supply of 600 110 kV galvanised steel transmission-line towers for Roxburgh-Dunedin 110 kV line. Contract No. 198. Specifications available at N.Z. Govt. offices in London.

## CONTRACTS PLACED

**Chichester.** Installation of street lighting in three streets, General Electric Co., £1,485.

**Gateshead T.C.** Electrical installation for stage two of new Technical College, Robson and Coleman Ltd., £11,232.

**Shepshed U.D.C.** Electrical work in houses on Glenmore and Oakley estates, Maud W. Smithers, £2,304.

**Swadlincote U.D.C.** Third stage of electric lighting scheme, General Electric Co. Ltd., £3,217.

## *Your Queries — Answered*

**"Cerrobend" alloys,** suppliers of? F.M.—Mining and Chemical Products Ltd., Station Wharf Works, Alperton, Wembley. (22183)

**Paint, temperature indicating,** suppliers of? T.E.—J. M. Steel and Co., Ltd., Kern House, Kingsway, W.C.2. (22189)

**"Vogue" washing machines,** repairers of? L.E.—Metalcraft Mfg. Co. (Canada) Ltd., 1 Shortlands Rd., Kingston. Canadian Electric Washing Machine Co. (Gt. Britain), 45 South End, Croydon. (22203)

**"Flexolite" table lamps,** makers of? S.G.—Photax (London) Ltd., 70 Charlotte St., W.1. (22179)

**"Ingraham" clocks,** agents for? L.B.—Britannia Electric Lamp Works Ltd., 14 Sunbeam Rd., N.W.10. (22195)

**"Deren" convector heaters,** makers of? S.C.—De Renzi Holmes and Co. Ltd., Fox's Lane, Wolverhampton. (22209)

*The above are selected from questions we have answered this week. If you have a query, send it to us.*

**Widnes T.C.** Supply of (*a*) 252 cut-off lanterns, Metropolitan-Vickers Electrical Co., Ltd., (*b*) same number sets of control gear, Philips Electrical Ltd., and (*c*) supply of concrete columns and installation of scheme, Revo Electric Co., Ltd.

**Wortley R.D.C.** Installation of wiring and fittings in 184 houses at Ecclesfield and Loxley, Tinsley Electric Co., Yorkshire Electricity Board and A. S. Bennett.

**PRICES OF CABLE METALS AND OTHER MATERIALS**
*(at Tuesday night)*

| | £ s. d. | New York price |
|---|---|---|
| COPPER, electrolytic ... ... ... | 227 0 0 | £220 0 0 |
| LEAD, good soft pig (foreign) ... ... | 170 0 0 | 152 0 0 |
| " " " "English" quality ... | 171 10 0 | |
| TIN (99·99·75%) ... ... (Cash) | 977-977½ | — |
| " (3 months) ... ... ... | 977-977½ | — |
| ALUMINIUM, commercial purity (del.) | 148 0 0 | — |
| ZINC ... ... ... ... ... | 190 0 0 | 156 0 0 |
| ARMOURING: | | |
| Galv. Steel Wire (0·104 in.) ... | 55 5 0 | — |
| Mild Steel Tape (0·04 in.) ... ... | 32 5 0 | — |

# GAZETTE ANNOUNCEMENTS

## COMPANIES ACTS

**Fordham Electrical Engineering Co. Ltd.** Last day for receiving proofs, Mar. 1. Liquidator is H. P. Naunton, Senior Official Receiver and Liquidator, Inveresk House, 346 Strand, W.C.2.

**Hale Electric Co. Ltd.** Petition for winding-up was presented on Feb. 4 and was directed to be heard on Feb. 18.

**Midland Wireless and Electrical Appliance Co. Ltd.** Resolution for voluntary winding-up passed at meeting on Feb. 1 and H. L. Barlow, of 66 Alma St., Luton, was appointed liquidator.

**Mitchell Electric Ltd.** Petition for winding-up presented on Feb. 3 and directed to be heard at Royal Courts of Justice, London on Mar. 3.

**Roevac Metal Pressings Ltd.** Resolution for winding-up passed at meeting on Feb. 7. W. A. Walton, 13-15 Lever St., Piccadilly, Manchester, has been appointed liquidator.

**Solar Electric Co. Ltd.** Meeting of members will be held at 9 Cavendish Sq., W.1, on Mar. 17 at 2.30 p.m. to receive liquidator's report.

**Stelmar Ltd.** Resolution for winding-up passed at meeting on Jan. 29, when J. L. Harper, C.A., 9 Idol Lane, Eastcheap, E.C.3, was appointed liquidator.

**J. and E. Barrett.** Partnership between John Barrett, Bertha Barrett, Edith Abbott, and Richard Abbott, trading as electricians at 2 New Wellington St., Mill Hill, Blackburn, dissolved as from Dec. 31. All debts received and paid by J. Barrett and Fred. Walsh, who will continue business.

## BANKRUPTCY ACTS

*Public Examinations*

**Brentford.** I.D.C. Electrical Appliances, Hounslow. Public examination to take place at the Court House, Half Acre, Brentford, on May 9 at 11 a.m. First meeting was held yesterday. Date of receiving order, Feb. 6.

**Lincoln.** J. L. Parker, electrician of 15 West St., Horncastle. Public examination at the Guildhall, Lincoln, on April 3 at 11.30 a.m. First meeting was on Tuesday.

**Rochdale.** Jack Hibbert, radio and electrical engineer of 17 Manchester Rd., Haslingden, Rossendale. Public examination at County Court Buildings, Fleece St., Rochdale, on Mar. 25 at 11 a.m. Date of receiving order, Feb. 6.

**Stoke.** Frederick H. Bell, electrical engineer trading at 4 Attwood St., Kidsgrove, First meeting at Official Receiver's Office, 12 Lonsdale St., Stoke, on Feb. 23 at 11 a.m., and public examination at Town Hall, Hanley, on Mar. 20 at 2.30 p.m.

*Receiving Order*

**Barrow-in-Furness.** Robert E. Browne, electrical contractor trading as Browne Bros., at 121 Market St., Dalton-in-Furness. Date of order, Feb. 11.

*Order on Application for Discharge*

**Manchester.** Wm. A. Prince and Charles S. Prince, trading as Prince Bros., electrical contractors at 69 Princes St., Manchester. Discharges suspended one day and to take effect as from Jan. 15, 1952, on grounds of refusal of absolute order of discharge.

*Release of Trustee*

**Newcastle-on-Tyne.** Frederick F. Chicken, radio dealer and electrical contractor, trading at 42-44 Newgate St., and Biltons Court, Morpeth. Trustee was R. F. Howe, Official Receiver, 54 Westgate Rd., Newcastle.

*Intended Dividends*

**Canterbury.** Nicolaas A. R. Spreeth and Stanley H. Price, trading as Refrigeration Installations Co. at Sea St., Herne Bay. Last day for receiving proofs, Feb. 29. Trustee is E. C. Williams, Midland Bank Chambers, Herne Bay.

**Gt. Yarmouth.** Cyril F. Burns, electrical and radio engineer, trading at High St., Stalham. Last day for receiving proofs, Feb. 26. Trustee is F. R. D. Walter, Official Receiver, Castle Chambers, Opel St., Norwich.

**Newcastle-on-Tyne.** Noel W. Doidge and John C. Stephenson, trading as Doidge and Stephenson, electrical contractors, at 16 Coldwell St., Felling. Last day for receiving proofs, Mar. 1. Trustee is R. F. Howe, Official Receiver, Cribb Chambers, Westgate Rd., Newcastle.

*Dividend*

**Bradford.** Donald Rushworth, wholesale battery agent, trading at 2 Valley Parade, Bradford. First and final dividends of 1s. 6d. in £ payable on Feb. 27 at Official Receiver's Office, Hallfield Chambers, 71 Manningham Lane, Bradford.

## TRADE NOTES

**Cardiff Phone Nos.** With the installation of new equipment at Cardiff, many local telephone numbers have been changed. Some of these we have already noted. Others (with new numbers in parentheses) are: British Electrical Repairs Ltd. (26221); Dictograph Telephones Ltd. (27837); MacWhirter Ltd. (21346); Marconi Marine Co. (31466); and L. Sterne and Co., Ltd. (26408).

**Change of Address.** As from Mar. 18, the address of Engines and Electrics Ltd. will be 48 Princes Gate, London S.W.7. Tel.: Kensington 4401.

# BUSINESS PROSPECTS

## HOME

**Aberdeen.** It is proposed to build Rosemount secondary and Hanover St. primary schools at costs of £129,560 and £42,107 resp. County E.C. approved provision of additional accommodation at Gordon schools, Huntly, at estimated cost of £149,000.

**Accrington T.C.** Approval given for rewiring of Market Hall.

**Ashton-under-Lyne.** Adaptations to Lakeside Institution are to cost about £48,545.

**Barnet.** Secondary school in Barnet Lane and infants' school on Bevan estate are estimated to cost £185,225 and £42,470.

**Blaby (Leic.) R.D.C.** Total of 70 houses to be erected on three sites.

**Bridgnorth (Salop) R.D.C.** Housing scheme to be prepared for Highley No. 2 site comprising between 100 and 130 dwellings.

**Brighton T.C.** Extensions to be carried out (costing up to £7,500) at Varndean school. Education Officer, Marlborough House, Old Steine.

**Buncrana (Donegal) U.D.C.** Erection of 56 houses at Ardravon. F. J. O'Brien, town clerk, Town Clerk's Office, Upper Main St., Buncrana.

**Carlisle.** Eighty flats to be built to plans by City Engineer, L. J. A. Stow. Also it is proposed to erect flats, houses for aged and shops on Belah, Upperly and Harraby estates. Plans in hand for erection of junior school at Harraby. Also the Cumberland and Westmorland T.A. have approved alterations costing £93,640 to Swifts Row Centre.

**Chester-le-Street R.D.C.** Tenders expected to be invited soon for erection of 101 houses. F. Bowman is council's architect.

**Cumberland C.C.** is considering installation of electricity at Victoria and Wilson schools, Workington; and Gamblesby, Welton, Wigton county, St. Bees, Penrith and Hesket-New-Market schools. County Architect is J. H. Hangham, Portland Sq., Carlisle.

**Deal T.C.** Erection of 32 houses on North Deal estate. Borough Engineer and Surveyor, Municipal Offices, Queen St.

**Dumfries.** Approval sought for second development of Marchmont High School.

**Easington (Dur.) R.D.C.** Application made for sanction to borrow £60,061 for proposed housing schemes.

**Eastbourne T.C.** Approval sought to plans for 455 dwellings, shopping centre, public house, church, etc., at Langley Village.

**Eccles T.C.** Erection of 102 houses on Ellesmere Park estate. Borough Engineer and Surveyor, Town Hall.

**Essex.** Three-storey block of shops and two-storey building comprising office accommodation on Avely site.

**Glenrothes Development** Corpn, are to erect second shopping centre at Woodside comprising 12 shops, 13 houses and other buildings. Names to secretary of Corpn., Woodside, Glenrothes, Fife.

**Gt. Yarmouth T.C.** Erection of Peterhouse junior school at Gorleston. F. Jackson, Schools Architect, 15 Regent St.

**Hamsworth R.D.C.** Erection of 84 houses in eight groups of between 24 and 4. S. Price, Engineer and Surveyor, Brierley Hall, Brierley, nr. Barnsley.

**Hull.** Application to be made for sanction to borrow £85,180 for erection of 76 dwellings on Bilton Grange estate.

**Leeds.** Allocation of 2,000 houses has been received for year. Tenders likely to be invited shortly for erection of 220 houses on Moorside estate.

**Limerick.** Approval received for erection of schools at Rathkeale, Caherconlish and Kilmallock.

**Luton T.C.** Erection of 60 houses on Ramridge estate. Borough Engineer, Town Hall. Plans approved for erection of factory in Crescent Rd. for Browne and Day Ltd.

**Manchester.** Council recommended to apply for sanction to borrow £419,494 for erection of 303 houses and flats at Wythenshawe.

**Merstham (Surrey).** A four-storey building comprising shops and 42 flats is to be built at estimated cost of £195,700.

**North Riding.** Erection of infants' school at Eston. F. Barraclough, County Hall, Northallerton.

**Nuneaton T.C.** Approval sought for plans for 232 houses and 12 bungalows on Camp Hill site. Also 32 houses are proposed for Galley Common site.

**South Shields.** Cairns and Byles, "The Cedars," Osborne Rd., Newcastle-on-Tyne, have been appointed consultant electrical engineers for high school extension scheme. Renewal of wiring and fitting of three-point plugs are among recommended improvements to a further 380 houses on Cleadon Park estate.

**Tonbridge U.D.C.** Erection of 60 houses in 15 blocks on Cage Farm estate. Engineer and Surveyor, Tonbridge Castle.

**Wallasey T.C.** Construction o Leasowe secondary school. Borough Architect, Town Hall.

**Windsor T.C.** Tenders being invited for site works for 238 houses on Manor Farm estate. G. S. Baker is Borough Engineer and Surveyor.

## OVERSEAS

**Cuba.** Ensebio Benitez Perez O'Reilly 514, Havana, wishes to import 110 V and 220 V electric irons and 110 V kitchen mixers. Irons should have price of about 28s. 9d.

**Venezuela.** Gonzalez Gorrondona and Cia., Apartado 427, Caracas, are interested in representing U.K. manufacturers of petrol and diesel engines from 5 to 70 b.h.p. and electric generating sets of all sizes.

# TRADE MARKS

*This information is extracted from the Official Journal by permission of the Controller.*

**Dixoclene.** 703,516. Class 9. Floor polishing and cleaning machines, scrubbing machines, etc. R. G. Dixon and Co., Ltd. Capitol Works, Empire wa Wembley, Middx.

**Therasonel.** 703,462. Class 9, and 703,463, Class 10. Electronic apparatus for generating supersonic pressure waves. Ateliers de Constructions Electriques de Charleroi, 33 rue du Congres, Brussels, Belgium.

**Unimatic.** 702,525. Class 9. Solenoid-operated valves for controlling the flow of pneumatic or hydraulic pressure. Dunlop Rubber Co., Ltd., Fort Dunlop, Erdington, Birmingham 24.

## NEW COMPANIES

*Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, London W.C.2*

**Hale Electric (Electronics) Ltd.,** Radio Works, Talbot Rd., W. Ealing, W.13. Electronic engineers, research workers, etc. Cap.: £5,000. Dirs.: A. S. Barker, E. A. Barker, F. A. Culling and H. J. E. Shayler.

**V. and D. Keale Ltd.,** 156 High St., Staines. To take over business of electrical and wireless engineers carried on at Staines as "V. and D. Keale." Cap.: £10,000. Dirs.: Mrs. E. M. Keale and Mrs. Q. E. Underwood.

**Purlac Equipment Ltd.,** 92 South Rd., Hailsham, Sussex. Dairy, refrigerating and general engineers, manufacturers of and dealers in refrigerating and ice-making machinery, milk pipes, etc. Cap.: £100. Dirs.: not named. Subs.: C. W. Archer and W. C. Paske.

**Thames Side Electrical Services (Staines) Ltd.,** 51 Thames St., Staines, Mdx. Cap.: £1,000. Permt. dirs.: H. M. Pollen and Teresa M. Little.

**D. R. Weir (Ewell) Ltd.** Electricians, etc. Cap.: £5,000. Dirs.: D. R. Weir and J. R. Weir, 139 Wickham Av., North Cheam; Madeleine T. Hey and Audrey P. Hey.

**A. J. Whittemore (Aeradio) Ltd.,** 160 Terminal Bldg, Croydon Airport, Croydon, Surrey. Manufacturers of and dealers in aeroplanes and all components, fittings and sundries, including aircraft radio and radar equipment, etc. Cap.: £100. Dirs.: A. J. Whittemore and R. A. Peacock.

**L. H. W. Wyatt Bros. Ltd.** To take over business of engineers and contractors to the telephone, electricity and radio trades carried on as "L. H. W. Wyatt," at 6 Robsart St., Brixton, S.W.9. Cap.: £1,000. Dirs.: Lord Harold Walter Wyatt, J. F. Wyatt and L. H. Wyatt.

**Youngs Electrical Services Ltd.,** 7 Carmichael St., Gunnislake, Cornwall. Cap.: £3,000. Prmt. dirs.: R. P. Young and Ivy M. Young.

**Zest Equipment Co. Ltd.,** sellers, manufacturers and producers of and dealers in electrical apparatus and appliances, in particular all types of regulator controls for the ventilation, dust extraction and general sheet-metal industry, etc. Cap.: £5,000. Dirs.: N. A. Petrali, 6 The Highlands, Abbotts Rd., New Barnet; R. J. C. Barrington, and Eileen D. Marshall.

## MEETINGS TO NOTE

### THURSDAY, FEB. 21

INST. OF WELDING (N. London Branch).—"Welding and Prefabrication in Shipbuilding." D. M. Kerr. Polytechnic Inst., Regent St., W.1, 7.30 p.m.

INCORP. PLANT ENGRS. (Liverpool Branch).—"Refrigeration." W. F. Ball, Radiant House, Bold St., 7.15 p.m.

I.E.E. (Southern Centre).—Annual dinner and dance at Polygon Hotel, Southampton, 7 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (Birmingham Branch).—"Electronics as Applied to Temperature and Combustion Control." H. A. Stevenson and L. Neall. Imperial Hotel, 6.30 p.m.

I.E.S. (Gloucester & Cheltenham Centre).—"Lighting of the New House of Commons." C. Dykes Brown. Cadena Cafe, High St., Cheltenham, 6.15 p.m.

I.E.S. (Bradford Group).—"School of Lighting." J. F. Roper. Y.E.B., Sunbridge Rd., 7.30 p.m.

I.E.E. (London Utilisation Section).—"Inherent Current, Voltage and Speed Control Dynamo-Electric Machinery." J. C. Macfarlane, J. W. Macfarlane and W. J. Macfarlane. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (E. Midland Centre).—"Protection of Electrical Power Systems—Critical Review of present-day Practice and Recent Progress." H. Leyburn. District meeting at Duke of Wellington Hotel, Broadgate, Lincoln, 7.15 p.m.

I.E.E. (Irish Branch).—"Electrical Equipment of the Eire Hydro-Stations." J. B. S. Lawler, J. A. V. McEvoy, S. E. O'Neill and B. Unden. Trinity College, Dublin, 6 p.m.

### FRIDAY, FEB. 22

JNR. INSTN. OF ENGINEERS.—"Lessons of Anglo-American Productivity Reports." R. G. Hooker. 39 Victoria St., S.W.1, 6.30 p.m.

I.E.E. (London Educ. Circle).—Discussion on "Engineering Graduation Theses at University of Cape Town." Prof. B. L. Goodlet. Savoy Place, W.C.2, 6 p.m.

I.E.E. (Western Centre).—Annual dinner and dance at Seabank Hotel, Porthcawl, 6.30 p.m.

A.S.E.E. (Nottingham Branch).—"Electronic Control in Engineering." K. J. Martin. Electricity Showrooms, Sithy Row, 7.30 p.m.

ELECTRICAL RESEARCH ASSOC.—Annual luncheon at Connaught Rooms, London. (Postponed from Feb. 8.)

### MONDAY, FEB. 25

I.E.S. (Leeds Centre).—"Electric Lighting—Contractor's Viewpoint." J. Ashmore. L.S.B., Aire St., 7 p.m.

I.E.E. (London Radio Section).—Debate "The Lone Worker can no longer make a Major Contribution to Radio Development." Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (Mersey and N. Wales Centre).—"Earthing." P. W. Cave. Carter's Cafe, Bridge St., Warrington, 7 p.m.

I.E.E. (N.E. Centre).—"Electricity in Newspaper Printing." A. T. Robertson. Neville Hall, Westgate Rd., Newcastle, 6.15 p.m.

I.E.E. (S. Midland Radio Group).—"Trunk Radio Systems." D. C. Espley. James Watt Inst., Gt. Charles St., Birmingham, 6 p.m.

I.E.E. (Western Utilisation Group)—"Modern Developments in Electric Welding." H. G. Taylor. Elect. Showrooms, Colston Ave., Bristol, 6 p.m.

A.S.E.E. (Bournemouth Branch). "Germanium Crystals." S. A. Bell. Grand Hotel, 7.30 p.m.

### TUESDAY, FEB. 26

I.E.E. (London Students Section).—"Introduction to H.V. Air Blast Circuit-Breakers." D. J. Kingsbury and D. B. Johnston. Savoy Place, W.C.2, 7 p.m.

INSTN. OF HEATING AND VENTILATING ENGRS. (Scottish Branch).—"Automatic Controls." R. Russell. Engrng. Centre, Sauchiehall St., Glasgow, 6.30 p.m.

SOC. OF INSTRUMENT TECHNOLOGY.—"Temperature Pocket Lags." W. Fishwick. Manson Hse., Portland Place, W.1, 7 p.m.

I.E.E. (E. Midland Centre).—Junior members' night at Loughborough College, 6.30 p.m.

I.E.E. (N.W. Centre).—Annual lecture in co-operation with Manchester University.

I.E.E. (Scottish Centre).—"Inductor Compass." A. Hine. 39 Elmbank Cres., Glasgow, 7 p.m.

### WEDNESDAY, FEB. 27

I.E.E. (London Supply Section).—"Performance of Natural Draught Water Cooling Towers." N. Chilton. Savoy Place, W.C.2, 5.30 p.m.

I.E.E. (N. Lancs. sub-centre).—"Electricity in Newspaper Printing." A. T. Robertson. Queen St. Library, Blackpool. 7 p.m.

I.E.E. (Southern Centre).—"Review of British Underground Railway Practice." T. S. Pick and R. Dell. Technical College, Weymouth, 6.30 p.m.

### THURSDAY, FEB. 28

I.E.E. (London).—Annual dinner at Grosvenor House, Park Lane, W.1, at 7 p.m.

I.E.E. (E. Midland Centre).—Discussion on "Outdoor Substations up to 11 kV." A. E. Strong. District meeting at Corn Exchange, Spalding, 7.30 p.m.

### FRIDAY, FEB. 29

INSTN. OF MECHANICAL ENGRS.—"Gear-tooth Stresses and Rating Formulae." H. E. Merritt. Storey's Gate, S.W.1, 5.30 p.m.

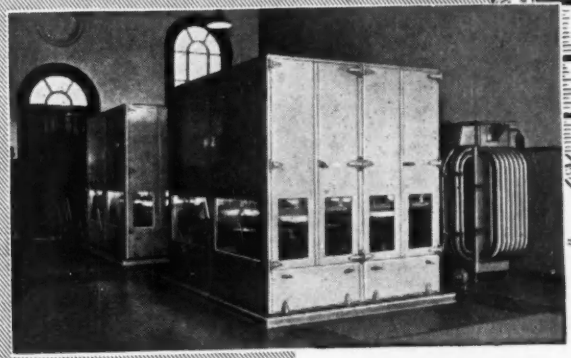
E.P.E.A. (Southern Tech. Group).—"Modern Trend of Switchgear Design." A. T. Crawford. S. Divisional H.Q., Portsmouth.

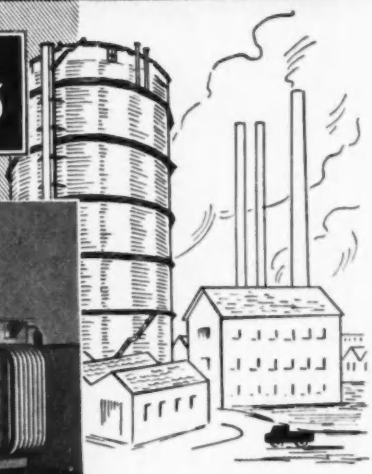
I.E.E. (E. Midland Centre).—"Domestic Electrical Installations—Some Safety Aspects." H. W. Swann. District meeting at University Arms, Cambridge, 7.15 p.m.

E.I.B.A. (Birmingham Branch).—Dance at T.I.S.C. Ballroom, Oldbury. (Postponed from Feb. 15.)

# Converting A.C. to D.C.

## Hewittic Rectifiers





## for INDUSTRIAL APPLICATIONS

The problem of providing a D.C. supply—for the operation of variable speed D.C. drives, electrolytic plant, electric locomotives and trucks, cranes, hoists, lifting magnets, magnetic clutches and separating plant, for small scale or bulk charging of batteries for electric vehicles, etc.—for almost every application where D.C. is required—is most effectively solved by installation of a HEWITTIC Rectifier, the simplest, most reliable converting plant made.

This equipment operates at high efficiency with corresponding low running costs, requires negligible maintenance, *operates completely unattended*, is easily installed in existing buildings and awkward sites without special foundations or the need for crane facilities.

***The Illustrations show:***

*Above:* *A Hewittic rectifier installation supplying D.C. motor driven plant at a gasworks*

*Left:* *35 kW Hewittic rectifier operating a rubber calender: providing an extremely wide range of speed variation by means of grid control*

**HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD., WALTON-ON-THAMES, SURREY**

*Telephone: Walton-on-Thames 760 (8 lines) Telegrams: "Electric," Walton-on-Thames*

*"A job to be proud of!"*

**What satisfaction in a job well done. It is *inevitable* with Metallic quality and consistent accuracy.**

Screwed and Socketed Conduit Thread.

Sunk-type Switch Iron Cover.

Sunk-type Plug Fitting Iron Cover.

Direct Mounting Flat-type Ceiling Rose.

*It always pays to SPECIFY* METALLIC

# CONDUIT TUBE & FITTINGS

A TI COMPANY

**THE METALLIC SEAMLESS TUBE Co. Ltd., Ludgate Hill, BIRMINGHAM 3. Tel. CEN 7167**

**Also at London, Newcastle-on-Tyne, Leeds, Swansea and Glasgow**

# CLASSIFIED ADVERTISEMENTS

OFFICIAL TENDERS AND APPOINTMENTS

WANTED · FOR SALE
WORK WANTED

**Those wishing to advertise in these pages should send the text to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London W.C.2, before 10 a.m. on TUESDAY of week of issue. Official Displayed Advertisements are charged at 42s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted will be published four times for twice the single insertion rate. Fee for Box No. and postage on replies is 2s.**

## TENDERS INVITED

### TYNE IMPROVEMENT COMMISSION

SUPPLY, LAYING AND JOINTING OF ELECTRIC CABLES, ETC., FOR IRON ORE SCHEME, TYNE DOCK

THE TYNE IMPROVEMENT COMMISSIONERS invite tenders from experienced contractors for the supply, laying and jointing of electric cables in connection with the power supply to the new iron ore discharging and handling plant at Tyne Dock, South Shields, County Durham.

A copy of the contract documents and drawings may be obtained from the undersigned upon payment of a deposit of one guinea, which will be returned upon receipt of a bona-fide tender.

Tenders, in sealed envelopes endorsed "Tender for Laying of Electric Cables," accompanied by the documents issued, and addressed to the Chairman of the Docks and Trade Committee, Tyne Improvement Commission, Bewick Street, Newcastle-upon-Tyne 1, must be delivered not later than noon on Monday, March 10, 1952.

The Commissioners do not bind themselves to accept the lowest or any tender.

J. K. McKENDRICK,
Secretary.

Tyne Improvement Commission Offices,
Bewick Street,
Newcastle-upon-Tyne 1.
February 14, 1952. (R 133)

### EGYPTIAN GOVERNMENT

TENDERS are called for by the Director General, Cairo Electricity and Gas Administration, for the supply of:—

POWER TRANSFORMERS
60 300 kVA output
40 150 kVA output
10 400 kVA output
delivered into store at Cairo.

Tenders should be submitted direct to the Director General, Cairo Electricity and Gas Administration, 53 Fouad El-Awal Street, Cairo, Egypt, not later than noon on the 5th March, 1952.

Copies of the necessary conditions of tender and specification can be obtained on application to the Chief Inspecting Engineer, Egyptian Government, 41 Tothill Street, London S.W.1, against remittance of £2 1s. per set, which sum is not returnable. Cheques must be endorsed permitting transfer to an Egyptian Government Account. Copies of these documents are also available for scrutiny at the above address. (Reference No. Elec. and Gas 3/2/281 must be quoted in all correspondence.) (R 132)

### DENBIGHSHIRE EDUCATION AUTHORITY

PROPOSED NEW PRIMARY SCHOOL AT ABERGELE
TO ELECTRICAL CONTRACTORS

CONTRACTORS desirous of submitting a tender for the following works, viz.:—

ELECTRICAL INSTALLATION

TENDER BASED ON PLANS AND SPECIFICATION are invited to forward their names together with a deposit of £3 3s. 0d. (three guineas) which will be returned on receipt of a bona fide tender to Mr. G. D. Wiles, County Architect, Grove Park, Wrexham, not later than Wednesday, February 27, 1952.

No application to tender will be accepted after this date.

The deposit cheque is to be made payable to the "Denbighshire Education Authority" and crossed "Midland Bank Ltd."

The specification and plans will be despatched to con-

(Continued in next column)

(Continued from previous column)

tractors desirous of tendering on or about February 27, 1952.

Contractors will be required to provide proof that they have the organisation and necessary labour to carry out this work.

The lowest or any tender will not necessarily be accepted, nor will any allowance be made for estimates.

W. E. BUFTON,
County Offices, Clerk to the County Council.
Ruthin.
February 4, 1952. (R 134)

### ELECTRICITY CORPORATION OF NIGERIA

SPECIFICATIONS are being prepared and TENDERS will shortly be invited for the MANUFACTURE, SUPPLY, SHIPMENT, TRANSPORT TO SITE AND COMPLETE ERECTION OF 132 kV TRANSMISSION LINES in Nigeria for the Electricity Corporation of Nigeria. One section will connect Ibadan and Lagos, a distance of about 90 miles, and the other will connect Enugu and district to a new power station, a distance of about 70 miles. Both sections will be erected concurrently, but not necessarily by the same contractor.

These will be first sections of a major development programme which includes some 300 miles of 220 kV line with 33 kV and 66 kV subsidiary networks.

The tenderers will be at liberty to offer their most economical design of support to specified loadings and clearances in steel or ferro-concrete.

Forest and bush clearing for the route survey is being undertaken by the Corporation.

Preliminary enquiries may be addressed to:—
The Secretary-Manager, Electricity Corporation of Nigeria, Lagos, Nigeria,
or to:—
The Liaison Officer, Electricity Corporation of Nigeria, The Corner House, Great Peter Street, London S.W.1.
(R 131)

## APPOINTMENTS VACANT

### BROADSTAIRS AND ST. PETER'S URBAN DISTRICT COUNCIL

*Waterworks Department*

ASSISTANT STATION ENGINEER

APPLICATIONS are invited for an Assistant Station Engineer for Rumfields pumping station in the department of the Water Engineer at a wage of £6 5s. per week, rising after one year, subject to satisfactory service, to £6 15s. per week.

Applicants must be experienced in the maintenance of a.c. electric motors, automatic controls, general wiring and preferably have had experience of diesel engines and waterworks routine, including pumping and softening.

The successful applicant will be provided with a five-roomed cottage, rent free.

Applications, endorsed "Assistant Station Engineer," stating age, qualifications, present and past appointments, and experience, together with the names of two referees, should be addressed to Kenneth Josey, A.M.I.C.E., Water Engineer, Pierremont Hall, High Street, Broadstairs, to be received not later than Tuesday, March 4, 1952.

H. C. NORRIS,
Clerk of the Council.
February 13, 1952. (R 109)

## CITY COUNCIL OF SINGAPORE ELECTRICITY DEPARTMENT

THE COUNCIL has under construction a new Power Station for which orders have been placed for four 25,000 kW turbo-alternators together with six 187,500 lb boilers at 600 lb/p.s.i., 825° F, switchgear and ancillary equipment. The ultimate capacity of this station will be 150,000 kW.

To meet this large-scale expansion the Council invites applications for the following posts on the Permanent Establishment of the Electricity Department. Appointments will be on a three-years' agreement in the first instance. The age of retirement for officers on the Permanent Establishment is 55.

| Post | Minimum Age | Basic salary scale p.a. |
|---|---|---|
| A. DEPUTY ELECTRICAL ENGINEER | 35 | £2,310 fixed |
| B. POWER STATION SUPT. ... | 33 | £1,470-£1,610 |
| C. ASST. POWER STATION SUPT. ... | 31 | £1,274-£1,400 |
| D. MAINTENANCE ENGINEER—Boiler House and Turbine Room ... | 28/29 | £1,050-£1,218 |
| E. MAINTENANCE ENGINEER (Elec.) | 28/29 | £1,050-£1,218 |
| F. ASST. DISTRICT ENGINEERS ... | 25 | £1,050-£1,218 |
| G. TECHNICAL AND PLANNING ENGINEER ... | 32 | £1,680-£1,820 |
| H. JUNIOR TECHNICAL ASSISTANTS | 28 | £1,050-£1,218 |
| I. JUNIOR COMMERCIAL ENGINEER | 25 | £770-£840 |

Salaries are payable in Malayan dollars. $1 Malayan equals 2s. 4d.

Variable cost-of-living allowance and expatriation allowance are also payable, which at current rates would supplement the above basic salaries by amounts ranging from 94% to 102% according to salary and whether single, married or married with children.

Partly furnished quarters provided, if available, at 8% of basic salary or rent allowance (at present 12% of basic salary—maximum $120 per month) paid in lieu. Passages will be provided for each officer appointed, his wife and children under the age of 12 years at the date of sailing.

Leave: 1 month per year of service, plus period of voyage, on satisfactory completion of agreement; or 4 days a month of resident service, plus voyage leave after 48 months if appointed to the permanent staff and thereafter at shorter periods. 14 days local leave per year.

Compulsory provident fund contributions at present 7½% of salary, plus expatriation allowance to which the City Council donates 7½%, rising to 10% after 10 years' service, 15 % after 15 years' service and 20% after 20 years' service. This scheme is under review.

Please write briefly giving details of qualifications, experience and age, etc., to Peirce and Williams (Agents to the Council), 1 Victoria Street, London S.W.1. A memorandum will be sent to applicants considered suitable, who will then be asked to submit in duplicate their full applications.

Closing dates for full applications:—

Post A: Tuesday, March 11; Posts B to E: Tuesday, March 18; Posts F to I: Tuesday, March 25. (R 99)

## MIDLANDS ELECTRICITY BOARD

*Central Gloucestershire Sub-Area*

APPOINTMENT OF GENERAL ASSISTANT DISTRICT ENGINEER

APPLICATIONS are invited for the above position in the Cheltenham District of the Central Gloucestershire Sub-Area.

Applicants should have had experience in all branches of distribution work, including operation and maintenance of high and low voltage cables and overhead lines, substations, etc. Appropriate technical qualifications will be considered an advantage.

Conditions of service will be in accordance with the National Joint Board Agreement, and the salary will be in Class "E," Grade 11, £504 per annum.

Applications in writing, giving age, full particulars of experience, present salary and position, should be forwarded to Sub-Area Manager, Midlands Electricity Board, 126 London Road, Gloucester.

A. STEPHENS,
Secretary.

February 11, 1952. (R 111)

## NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

DEMONSTRATOR

APPLICATIONS are invited for the position of Demonstrator in the North Caledonia Area of the Board. Applicants should be qualified to advise generally on electrical appliances, and give cooking demonstrations in showrooms and in consumers' homes. Possession of the E.A.W. Certificate will be a definite advantage.

The Terms and Conditions of employment will be in accordance with the N.J.C. Agreement (Administrative and Clerical Grades). Salary Grade 1 (£360/£440 per annum).

Applications stating full details of age, qualifications, experience and present position should be forwarded within 14 days to The Area Manager, West Villa, South Street, Elgin. (R 147)

## BRITISH ELECTRICITY AUTHORITY

*Southern Division*

APPLICATIONS are invited for the following appointments:—

Vacancy No. 288. ASSISTANT SHIFT CHARGE ENGINEER, Poole Generating Station.

Applicants should have had previous experience in a large modern generating station and preference will be given to those with experience of high operating temperatures and pressures, and pulverised fuel equipment. Manufacturing works experience will be an advantage.

Salary, N.J.B. Class "H," Grade 9 (£560-£685).

Vacancy No. 289. ASSISTANT SHIFT CHARGE ENGINEER, Swindon Generating Station.

Applicants should have had previous experience in a modern generating station. Manufacturing works experience will be an advantage.

Salary N.J.B. Class "E," Grade 9 (£567-£579).

Vacancy No. 290. GENERAL ASSISTANT ENGINEERS, Technical Department

Applicants should have had suitable experience of technical work in relation to either protective gear, system development or special investigations into technical problems.

Salary N.J.B. Class "AX-CX," Grade 8 (£481-£655).

For all posts, preference will be given to those who possess either qualifications and experience admitting to Corporate membership of a recognised professional Institution, or who are studying for the examinations of an Institution.

Application forms are obtainable from P. D. A. Oliver Divisional Secretary, 111 High Street, Portsmouth, and should be returned not later than March 7, 1952. (R 169)

## MIDLANDS ELECTRICITY BOARD

*Shropshire and Herefordshire Sub-Area*

APPLICATIONS are invited for the position of DEMONSTRATOR in the Ludlow District.

Applicants should have had a good general education and the possession of a recognised diploma in Domestic Science and Electric Housecraft will be an advantage.

Candidates should be able to conduct lecture demonstrations both in the Service Centres and on consumers' premises and to advise consumers on the selection and use of electrical apparatus.

Salary and conditions of service will be in accordance with the N.J.C. Grade 1 within the range of £360/£450 per annum, according to experience and qualifications.

The successful applicant will be required to contribute to the Board's Superannuation Scheme, if eligible.

Training will be given where necessary to a suitable applicant.

Applications in writing, stating age, education, details of training, and subsequent experience, should be forwarded within fourteen days to: Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary.
(R 148)

## NORTH WESTERN ELECTRICITY BOARD

APPOINTMENT OF THIRD ASSISTANT ENGINEER
Purchasing Section, Chief Engineer's Department

THE Engineer appointed will be responsible to the Purchasing Officer for the preparation of contract documents, works progressing and conducting purchasing negotiations with suppliers.

Preference will be given to applicants who have works and contract department experience with firms manufacturing plant for the Electricity Supply Industry and who are Corporate Members or Graduates of the Institution of Electrical Engineers or who hold exempting qualifications.

Salary scale: £629-£834 p.a. Grade "AX/DX.5." N.J.B. conditions.

Applications, stating age, education, qualifications and experience, present post and salary, should be received by the Establishment Officer, The North Western Electricity Board, Cheetwood Road, Manchester 8, by March 1, 1952. (R 170)

## BRITISH ELECTRICITY AUTHORITY

*Yorkshire Division*

APPLICATIONS are invited for the superannuable position of POWER STATION SUPERINTENDENT at Doncaster Power Station.

Salary: £944-£978 p.a. N.J.B. Agreement, Class "D," Grade 1.

Wide experience in the operation and maintenance of modern power station plant essential, and preference will be given to candidates who are Corporate Members of the I.E.E. and/or I.M.E.

Application forms obtainable from Divisional Secretary (Establishments), British Electricity House, St. Mary's Road, Leeds 7, to be returned within 14 days of the appearance of this advertisement. (R 110)

## EASTERN ELECTRICITY BOARD

*Chilterns Sub-Area*

APPOINTMENT OF GENERAL ASSISTANT ENGINEER
(Operation and Maintenance Section)

APPLICATIONS are invited for the appointment of a General Assistant Engineer in the Operation and Maintenance Section on the staff of the Sub-Area Engineer at Bedford.

Candidates should have had experience in the operation and maintenance of Urban and Rural distribution systems at voltages up to 33 kV, including commissioning and testing of protective gear. A knowledge of radio and telephone equipment, although not essential, and Graduate membership of the Institution of Electrical Engineers or equivalent qualifications, will be advantageous.

The salary will be in accordance with Class "K", Grade 13 of the National Joint Board Salary Agreement, commencing at £563 p.a. Future salary and conditions of service will be in accordance with agreement made from time to time by the appropriate negotiating bodies.

The successful candidate will be required to contribute to a Superannuation Scheme and may be required to undergo a medical examination.

Applications, stating age, education, technical qualifications and experience, with details of present appointment, and salary, should be submitted to The Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford, within fourteen days of the appearance of this advertisement. (R 151)

## BRITISH ELECTRICITY AUTHORITY

*Eastern Division*

APPLICATIONS are invited for the following superannuable positions. Salary and conditions of service will be in accordance with the National Joint Board agreement.

2nd ASSISTANT STATION CHEMIST
Rye House Generating Station

Applicants who possess scientific education equivalent to Inter. B.Sc. or Higher National Certificate in Chemistry will be preferred and they must have practical knowledge of the sampling and testing of coal, oil and water.

Salary Class "G," Grade 11, £553-£573.

JUNIOR ENGINEERS
Peterborough Generating Station

Preference will be given to applicants who have had previous experience in a Generating Station and who have reached the standard of the Ordinary National Certificate in Electrical Engineering or its equivalent.

Salary Class "F," Grade 15, £375; Class "F," Grade 14, £447.

Depending on qualifications.

Applications, stating age, qualifications and experience, should be sent to the Divisional Controller, British Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, by March 8, 1952.

W. N. C. CLINCH,
Controller.
(R 154)

## BRITISH ELECTRICITY AUTHORITY

*North Eastern Division*

APPLICATIONS are invited for the appointment of ASSISTANT SHIFT CHARGE ENGINEERS at North Tees "C" Power Station, Billingham-on-Tees.

Applicants should have received a thorough technical and practical training followed by experience in the operation of generating plant.

The local housing programme takes into account the commissioning of new industrial works in the area, and the successful applicants would receive consideration for the tenancy of Council houses allocated to these works.

The salary for these appointments will be in accordance with the National Joint Board, Schedule A, Grade 9, Class "J" (£699-£728 per annum).

Forms of application may be obtained from the Divisional Establishments Officer, British Electricity Authority, North Eastern Division, Carliol House, Newcastle-upon-Tyne 1, to whom completed forms should be returned to arrive not later than March 3, 1952. (R 114)

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER, Rhos, near Wrexham. Salary £528/£545 p.a. (N.J.B. F.11).

Applicants should preferably have the technical qualifications to enable them to become Chartered Electrical Engineers and have had experience in the H.V. and M.V. Overhead and Underground Distribution work. Ability to speak Welsh would be an advantage.

The appointment is superannuable and subject to medical examination.

Application forms from the Manager, Ref. 33A, No. 4/5 Sub-Area, Merseyside and North Wales Electricity Board, Electricity House, Rhostyllen, nr. Wrexham. Closing date, March 3, 1952.

JAMES RANKIN,
Secretary.
(R 146)

## BRITISH ELECTRICITY AUTHORITY

*East Midlands Division*

APPLICATIONS are invited from suitably qualified persons for the following positions:

12/52 ASSISTANT MECHANICAL MAINTENANCE ENGINEER (Boiler House), Spondon.

Applicants should have had a thorough mechanical training and possess considerable experience in the maintenance of all types of boiler house equipment to be found in large generating stations. Preference will be given to holders of an Ordinary National Certificate in Mechanical Engineering or its equivalent.

The salary for this appointment will be in accordance with Class "H," Grade 9, of the National Joint Board Agreement.

13/52 DIVISIONAL CHEMIST,
Generation Operation Department, Div. Headquarters.

Applicants should preferably hold a University degree in chemistry and/or be a corporate member of the Royal Institute of Chemistry. Candidates must have a wide experience in the analysis and behaviour of oil, water and fuel associated with high pressure and high temperature power station plant. Candidates should clearly express their knowledge and experience of research and practice associated with metallurgy and metalography in respect of metals and alloys used on high-temperature steam plant.

The duties of this post will include the full technical direction of the staff and laboratories of all power stations in the Division, and special surveys and research work, either at a central laboratory or through the existing Divisional arrangements.

The salary for the above appointment will be in accordance with Schedule C, Class "AX/DX," Grade 1, of the National Joint Board Agreement.

17/52 JUNIOR ENGINEER, Hinckley

Applicants should have a sound technical training and experience in power station operation would be an advantage.

The salary will be in accordance with Class "B," Grade 12, £389-£405 per annum, of the National Joint Board Agreement.

The above positions will be superannuable within the terms and conditions of the British Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, and should be returned not later than February 29, 1952.

L. F. JEFFREY,
Divisional Controller.
February 8, 1952. (R 83)

## COLLEGE OF TECHNOLOGY, BIRMINGHAM

*Department of Electrical Engineering*

APPLICATIONS are invited for the post of Grade "B" ASSISTANT TEACHER IN ELECTRICAL ENGINEERING.

Candidates should have a degree in electrical engineering or its equivalent, and will be required to teach to the standard of the Final City and Guilds of London Institute examination in electrical installation work and to the Ordinary National Certificate. Practical experience in electrical maintenance work will be an advantage.

The person appointed will be required to take up duty on September 1, 1952.

Salary will be in accordance with the Burnham (Further Education) scale for Grade "B" Assistant Teachers (men: £450 x £25-£725; women: £405 x £20-£580).

Further particulars and form of application may be obtained from the Registrar, College of Technology, Suffolk Street, Birmingham 1, on receipt of stamped, addressed foolscap envelope. Completed forms should be returned to him not later than two weeks after the appearance of this advertisement.

C. McCAW,
Clerk to the Governing Body.
(R 112)

## BRITISH ELECTRICITY AUTHORITY

*Midlands Division*

MAINTENANCE ENGINEER (Electrical) required at Stoke Generating Station. N.J.B. Service conditions, superannuable appointment, salary within Schedule A, Grade E6, commencing at £679 per annum.

Higher National Certificate in electrical engineering or equivalent qualification required, together with sound technical training and practical experience in power station electrical maintenance.

Application forms available from Establishments Officer, 53 Wake Green Road, Birmingham 13, to be returned by March 8, 1952.

F. W. LAWTON,
Divisional Controller.
(R 149)

## BRITISH ELECTRICITY AUTHORITY

*London Division*

APPLICATIONS are invited for the following superannuable appointments. Salary and conditions of service in accordance with N.J.B. Schedule A, including London allowance.

BOILER HOUSE SUPERINTENDENT—Fulham Generating Station.

Candidates should have received a sound mechanical and electrical engineering training with a first-class technical background. A wide experience is necessary in the efficient operation and maintenance of large modern generating plant and auxiliary equipment, together with ability to plan and organise work to a strict time schedule. The engineer appointed will be concerned in the station's labour relations policy, and experience in this is necessary; modern concept of management is essential. Class "L," Grade 6—£1,020 12s. p.a.

STATION SHIFT CONTROL ENGINEER—St. Marylebone Generating Station.

Candidates should possess technical qualifications to at least Ordinary National Certificate standard and practical experience in control room operation. Class "E," Grade 10—£561 15s. p.a.

DEPUTY STATION SUPERINTENDENT—Stepney Generating Station.

Candidates should have received a sound technical, practical training and had extensive experience in the operation and maintenance of medium pressure turbine and boiler plant, e.h.t. switchgear, etc. They must also have had experience in the general management of power plants and a successful record in labour relations. Class "F," Grade 3—£931 7s. p.a.

STATION SHIFT CHARGE ENGINEER—St. Pancras Generating Station.

Candidates should have received a sound technical training and experience in the efficient operation of medium pressure turbine and boiler plant and e.h.t. switchgear. The successful candidate will be required to take full charge of the station operation on his shift of duty. Class "E," Grade 7—£660 9s. p.a.

ASSISTANT STATION SHIFT CHARGE ENGINEER—Bankside "A" Generating Station.

Candidates should have experience of the efficient operation of medium pressure turbine and boiler plant and e.h.t. switchgear. Class "F," Grade 9—£616 7s. p.a.

Applications for all the foregoing vacancies, stating age, qualifications and experience, should be addressed to the Divisional Secretary, British Electricity Authority, London Division, Ergon House, Horseferry Road, Westminster, S.W.1, to be received within 14 days of the publication of this advertisement.

H. V. PUGH,
Divisional Controller.
(R 113)

## SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of DISTRICT COMMERCIAL MANAGER, District 341 (Aberdare) in the Central Sub-Area of the Board.

Applicants should have held a position of administrative responsibility in the development and organisation of electricity supply to all classes of consumers.

The salary for the position will be in accordance with Class "D", Grade 3 (£788-£803-£817) of the N.J.B. Schedule for the electricity supply industry.

Applications, stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary to arrive by March 8, 1952.

D. G. DODDS,
Secretary.
St. Mellons, Cardiff. (R 171)

## UGANDA ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of ASSISTANT POWER STATION SUPERINTENDENT for the Owen Falls Hydro-Electric Generating Station; (initial capacity 90 MW comprising six Boving (Kaplan type) water turbines; ultimate capacity 150 MW).

Salary scale £860 by £40 to £1,100, plus temporary cost of living allowance of 20%. Commencing salary according to experience and qualifications. Free, partly furnished accommodation provided or allowance in lieu. Three years' contract in first instance with free passages to and from Uganda. Applicants must have good technical qualifications and experience and be Corporate Members of I.E.E. and/or I.M.E. The successful candidate will be expected to assist in existing thermal stations until the commissioning of hydro station.

Application forms and further information may be obtained from the Board's London Office, 129 Grand Buildings, Trafalgar Square, W.C.2. Applications to reach the undersigned by March 18, 1952.

P.O. Box 559, C. R. WESTLAKE,
Kampala, Chairman.
Uganda,
East Africa. (R135)

## BRITISH ELECTRICITY AUTHORITY

*East Midlands Division*

APPLICATIONS are invited for the following posts:

Vacancy No. 18/52

BOILER HOUSE SHIFT CHARGE ENGINEERS, Longford Generating Station, Coventry. Applicants must possess a sound technical training, have had good general engineering experience, a knowledge of the control and operation of large water tube boilers, ancillary plant and in the efficient combustion of fuels on Chain Grate Stokers.

Commencing salary will be in accordance with Class "G," Grade 9 (£621 rising to £648 p.a.) of the National Joint Board Schedule.

Vacancy No. 19/52

SHIFT CHARGE ENGINEER, Hinckley. Applicants should have had sound technical training and be fully experienced in the operation of steam Power Stations. The possession of an Ordinary National Certificate in Mechanical or Electrical Engineering or its equivalent will be an advantage.

The salary will be in accordance with Class "B," Grade 7 (£539 to £566 p.a.) of the National Joint Board Schedule.

Vacancy No. 20/52 and Vacancy No. 21/52

2nd ASSISTANT ENGINEER (Civil) and 3rd ASSISTANT ENGINEER (Civil). Applicants should hold a degree in Civil Engineering, be Corporate Members of the Institute of Civil Engineers or possess other equivalent qualifications. They must have had experience in design of heavy foundations, river works, structures in concrete and steel and other civil engineering works associated with the design of Power Stations. A knowledge of estimating would be an advantage.

The salary for 2nd Assistant Engineer will be within Schedule C, Class "AX/2" (£809 p.a.) of the N.J.B. Agreement.

The salary for 3rd Assistant Engineer will be within Schedule C, Class "AX/DX," Grade 5 (£629/834 per annum) of the N.J.B. Agreement.

Applications should be submitted on the official form, which may be obtained from the Divisional Establishments Officer, British Electricity Authority, Barker Gate, Nottingham, stating vacancy number, and should be returned not later than March 3, 1952.

L. F. JEFFREY,
Divisional Controller.
(R 150)

## SOUTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the position of ASSISTANT in the Commercial Department of District 222 (Neath) in the West Central Sub-Area of the Board.

Applicants must have had an engineering training and experience in the development of electricity supply generally. Preference will be given to applicants who possess the Higher National Certificate in Electrical Engineering, or its equivalent.

The salary for the position will be in accordance with Class "E," Grade 8 (£599 to £604 to £609) of the National Joint Board Schedule for the electricity supply industry.

Applications, stating age, present position and salary, qualifications and experience, and giving three referees, to be addressed to the Secretary, to arrive by March 1, 1952.

D. G. DODDS,
Secretary.
St. Mellons,
Cardiff. (R 139)

## CROWN AGENTS FOR THE COLONIES

ELECTRICAL ENGINEERS required for the Central Electrification Scheme in Cyprus for 2 tours each of two years with prospect of permanency. Salary according to qualifications and experience in the scale £960, rising to £1,200 a year. Cost-of-living allowance at present 10% of salary. Free quarters and passages. Liberal leave with full salary. Candidates must have had considerable experience in the maintenance and operation of a modern generating station. The erection and maintenance of high and low voltage overhead and underground a.c. distribution systems and substation plant, and administrative duties associated with a public electricity supply undertaking. Preference will be given to candidates who are corporate members of the Institution of Electrical Engineers or hold equivalent qualifications.

Apply by letter, stating age, full names in block letters and full particulars of qualifications and experience and mentioning this paper, to the Crown Agents for the Colonies, 4 Millbank, London S.W.1, quoting on letter M.29024B. The Crown Agents cannot undertake to acknowledge all applications and will communicate only with applicants selected for further consideration. (R 137)

## UGANDA ELECTRICITY BOARD

APPLICATIONS are invited for the appointment of ADMINISTRATIVE ASSISTANT at the Board's Head Office in Kampala. Applicants aged 25-35 should possess a university degree or diploma or recognised secretarial qualification. Experience of staff records and conditions of service and in dealing with a large amount of correspondence desirable.

Commencing salary in scale £580 by £40 to £780 to be fixed according to experience. 20% cost-of-living allowance payable in addition, plus free accommodation.

This post offers opportunities of future promotion. Application forms and further details may be obtained from the Board's London Office at 129 Grand Buildings, Trafalgar Square, W.C.2. Applications to reach the undersigned not later than March 10, 1952.

C. R. WESTLAKE,
Chairman.

P.O. Box 559,
Kampala, Uganda, East Africa. (R 136)

## YORKSHIRE ELECTRICITY BOARD

*Area Board Headquarters*

CHIEF ENGINEER'S DEPARTMENT.

APPLICATIONS are invited for the following appointment:—

THIRD ASSISTANT ENGINEER (Distribution Design (Mains) Section). (Vacancy No. 23/52).

Applicants should have had experience in the design and installation of underground cables up to and including 33 kV. Knowledge of oil-filled gas pressure installations, of cable manufacture, and of overhead line construction will be an advantage.

Applicants should be corporate or graduate members of the Institution of Electrical Engineers.

Salary: N.J.B. Agreement Schedule C "AX-DX" 5. Commencing salary £629 to £765, rising to £834 per annum.

Applications, stating the above vacancy number, and giving full details of age, qualifications, and experience, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, Leeds, within 14 days of the appearance of this advertisement. (R 138)

ADVERTISERS REQUIRE AGENTS, with live retail connection, to sell highly competitive domestic product in established field.—Particulars in confidence to Box No. 1481, Electrical Times. (R 117)

AN APPOINTMENT offering exceptional scope and opportunity is shortly to be made to fill the position of CHIEF ELECTRICAL INSPECTOR which will become vacant on the impending retirement of the present holder of that post. The successful applicant, whose age should not exceed 45, will have to possess wide and sound experience in the inspection and testing of telecommunications and light electrical equipment, and preference will be given to those with a knowledge of audio frequency and electrical measurements.—Write full details of qualifications, experience and salary required to Personnel Manager, The Phoenix Telephone and Electric Works, Ltd., The Hyde, Hendon, N.W.9. (R 168)

BRITISH ELECTRICITY AUTHORITY, North Western Division, requires STATION CHEMIST at Barton Generating Station, near Manchester. Salary: £747-£778, N.J.B., H.7. Applicants should preferably hold a university degree in chemistry, the A.R.I.C. or equivalent qualification. Experience in chemical testing of coal, water and oil in connection with power plant is desirable but not essential, providing applicant has good experience in chemical analysis.—Apply, quoting vacancy number 6/7, to Establishments Officer, British Electricity House, 825 Wilmslow Road, Manchester 20, before March 1. (R 119)

DEPUTY CHIEF ENGINEER required for a Power Station in Bihar, India. Must have sound technical training and practical experience in all branches of power generation and distribution up to 11 kV, and the operation and maintenance of turbo alternators and water tube boilers. Candidates must have had wide experience in the control and management of Electricity Supply Undertakings. A knowledge of the operation of stations in parallel with a major grid supply is desirable. Salary offered about £2,000 per annum. Three years agreement in the first instance with six months leave on full pay if re-engaged. Free partially furnished quarters, electricity, fuel and medical attention. Superannuation Fund. In the case of a married man, first class passages will also be paid for wife and young children. Applications should be addressed to Box No. FE/81, c/o 95 Bishopsgate, E.C.2 (R 157)

DRAWING AND TRACING, LTD., have vacancies for experienced SENIOR DRAUGHTSMEN and JUNIOR DETAIL DRAUGHTSMEN in their production drawing office, specialising in radio, electrical and mechanical engineering. 5-day week. Pension scheme. Good working conditions. Salary range £390-£533.—Write, stating age and experience, 456 Ewell Road, Surbiton, Surrey. (P 431)

**BOX No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London W.C.2**

## COMBUSTION ENGINEERS

COURTAULDS LIMITED require Assistant Combustion Engineers for their Engineering Headquarters, Coventry. Sound knowledge of combustion technology essential, also previous experience in the operation and testing of both watertube and Lancashire boilers and in dealing with problems in the firing of solid, liquid and/or gaseous fuels. Candidates should be prepared to travel to various factories in the U.K.—Please write for a detailed form of application (quoting the reference number B.6), to the:—

**Personnel Department,**
**COURTAULDS LIMITED,**
**16 St. Martin's-le-Grand, London E.C.1.** (R 10p)

DRAUGHTSMAN having works training and experience with power transformers up to 44 kV and 3,000 kVA. Ordinary National Certificate preferred. Working conditions admirable. Salary according to age and experience.—Box No. 1443, Electrical Times. (R 9)

DESIGNERS and DRAUGHTSMEN with experience in electronic or light mechanical engineering are required by the G.E.C. Research Laboratories, Wembley, Middlesex, for work at Stanmore. Vacancies exist for seniors with good academic qualifications and also for juniors. Excellent and interesting openings with good prospects.—Apply to the Staff Manager (Ref. GBLC/531), stating age and record. (R 153)

ELECTRICAL Contractors require competent OFFICE ASSISTANT for finalising account work. Knowledge of L.C.C. contracts preferred but not essential. Applications to be made in writing; these will be treated in strict confidence.—Evans and Shea Ltd., 12 Essex Road, Romford, Essex. (R 159)

ELECTRICAL ENGINEERING TECHNICAL ASSISTANTS are required for power supply and distribution. Applicants should not be more than 30 years of age and should have received a good general education. Applicants should also have a sound technical training and should preferably possess the Higher National Certificate in Electrical Engineering or equivalent. Practical engineering workshop training will be an advantage. Successful applicants will be engaged on a temporary basis in the first instance. Commencing salary £296 to £549 10s. per annum according to age and qualifications.—Applications in writing to Mechanical and Electrical Engineer, British Railways, Southern Region, 15 St. Thomas's Street, London Bridge, S.E.1. (R 79)

ELECTRICAL ENGINEERING MIDDLE EAST APPOINTMENTS:

(a) SENIOR MAINTENANCE ENGINEER, aged 35/40. Preferably A.M.I.E.E. and must have considerable power station experience.

(b) ASSISTANT ELECTRICAL ENGINEER, aged 25/30, for power station and refinery maintenance. Apprenticeship, H.N.C. and experience in either of above-mentioned types of work.

(c) ELECTRICAL PROTECTION ENGINEER, aged 25/30, to carry out all protection testing and fault location and to run electrical instrument repair and calibration workshop. Grad. Inst.E.E. and familiar with full power station and transmission protective schemes.

Substantial salaries and generous allowances. Initial family separation. Paid home leave at two-yearly intervals. Pensionable.—Write, quoting No. 172, to Box No. 5651, c/o Charles Barker and Sons Ltd., 31 Budge Row, London E.C.4. (R 120)

ELECTRICAL ENGINEERS required for design work on aircraft electrical systems.—Apply: Employment Manager, Vickers-Armstrongs, Ltd. (Aircraft Section), Weybridge, Surrey. (R 102)

ELECTRICIAN/HANDYMAN required for West End exhibition rooms and offices. Good hours and working conditions. Canteen. Progressive wages. Pension scheme.—Apply The Tea Centre, 22 Regent Street, S.W.1. (R 141)

ELECTRONIC ENGINEER, with good theoretical background to Higher National Certificate standard and with practical experience in use of valves in audio and radio frequency circuits, is required in the valve life testing laboratory at the G.E.C. Research Laboratories, Wembley, Middlesex.—Apply to the Staff Manager (Ref. GBLC/3/570), stating age and record. (R 172)

THE appointment of **CHIEF ACCOUNTANT** and **COMPANY SECRETARY** is vacant in a large independently owned Departmental Store. Commencing remuneration £1,750 per annum.

The appointment is an important one requiring experience and ability and applications therefore are only invited from those, of 40 years of age and under, holding the rank equivalent to that of Deputy Borough Treasurer or Chief Assistant in Local Government Service. For fuller details and for an application form write, not later than February 29, 1952, to

**MANAGING DIRECTOR, JAMES BEATTIE Ltd.**
**Victoria Street, Wolverhampton.** (R 56p)

**VENNER LIMITED**
require
**LABORATORY ASSISTANTS**
for development work on:—

1. Electro-mechanical devices. Minimum qualification. Higher National or equivalent.
2. Accumulators. Similar experience essential in both cases.

Write, call or 'phone Personnel Office,

**VENNER LTD., Kingston By-pass, New Malden.**
(Malden 2442) (R 174p)

ELECTRICAL INSPECTOR required by Firm of Consulting Engineers, Warrington Area; to supervise and report on work in progress on various electrical projects for Air Ministry, universities, hospitals, factories. Good salary offered to man with right experience.—Box No. 1473, Electrical Times. (R 80)

ENERGETIC AGENT required with first-class electrical connection not at present handling electrical accessories for London Postal Area. All sales handled through approved wholesalers so application from wholesalers cannot be considered.—The Kersons Manufacturing Co., Ltd., Hansons Bridge Road, Birmingham 24. (R 88)

ELECTRICAL STOREKEEPER. Must be fully conversant wiring accessories, switchgear. Take charge stockroom, trade counter, etc.—Full details experience, wage required to Managing Director, E. Dawson (Lamp Factors) Ltd., 10 Grays Inn Road, London, W.C.1. (R 180)

FERRANTI LTD. have vacancies for DRAUGHTSMEN on testing transformers and other specialised high voltage equipment. Permanent staff appointments with pension benefits.—Forms of application from Mr. R. J. Hebbert, Staff Manager, Ferranti Ltd., Hollinwood, Lancs. Please quote reference TDO. (R 116)

FITTER for Aberystwyth Power Station. Must be skilled diesel fitter, preferably with experience of generators. N.J.I.C. Wages and Conditions, rate 40.50d. per hour.—Applications giving age, experience and present employer to Divisional Secretary, Merseyside and North Wales Division, Clarke Gardens, Woolton, Liverpool. Closing date March 6, 1952. (R 156)

INSULATION ENGINEERS are required by the English Electric Co., Ltd., in Stafford, for experimental work on the insulation of all types of machinery, switchgear and transformers. Applicants should have a university degree or equivalent and experience of insulation development or research will be an advantage. Preference will be given to those aged between 25 and 35.—Please write, giving full details and quoting Ref. 433 to Central Personnel Services, English Electric Co., Ltd., 24-30 Gillingham Street, London S.W.1. (R 173)

KUWAIT OIL COMPANY LTD. invites applications for the post of POWER STATION SUPERINTENDENT. Must have had recognised technical training and wide experience of operation and maintenance modern medium pressure and temperature turbine and oil and gas-firing boiler plant. Thorough knowledge evaporators and boiler water treatment essential. Experience of installation and maintenance E.H.T. switchgear an advantage. Must have experience of the administration of a 22.5 M.W capacity Power Station. Preference will be given to candidates who are corporate members of I.E.E. Age 38-45. Salary starting not less than £1,300 p.a. clear, plus generous allowances, Pension Scheme and kit allowance.—Write giving personal details and quoting K.1401 to Box H/10 at 191, Gresham House, E.C.2. (R 155)

MALES required as TESTERS on Electrical Measuring Instruments. Good opportunities for young men with required electrical qualifications. Enfield district.—Write full details, age, etc., Box 9951, Frost-Smith Advg., 64 Finsbury Pavement, E.C.2. (R 68)

MERCURY arc rectifiers—vacancy for DESIGN AND DEVELOPMENT ENGINEER, on work of special interest, with excellent prospects. Good degree and some works training desirable. Previous rectifier experience not essential.—Apply to: Manager, Rectifier Engineering Dept., The British Thomson-Houston Co. Ltd., Rugby. (R 166)

MOTOR BULBS, WEST LONDON. FIRST-CLASS FOREMAN, headlamp section, specially experienced in 4-wire stem making. Salary up to £10 per week, plus bonus. Also Engineer Designer for production lamp making machinery, age 25-30. One 3-bedroom house available for right person.—Box No. 1499, Electrical Times. (R 176)

PROGRESS AND MATERIALS CLERK with light electrical engineering experience required immediately. Permanency for suitable man; five-day week. Contributory pension scheme.—Write, giving age, details of training, experience and salary required, to Hendrey Relays Ltd., 392 Bath Road, Slough, Bucks, for attention of General Manager. (R 115)

QUALIFIED CHEMIST required to take charge of laboratory in factory producing paper-insulated, lead-covered electric cables. Previous experience in this industry is essential.—Applications, giving full details of training, qualifications and experience, should be addressed to Aberdare Cables Ltd., Aberdare, Glamorgan, and endorsed "Chemist." (R 140)

REPRESENTATIVE required to cover Northumberland, Durham and the North Riding of Yorkshire. This is an interesting and worthwhile post for a man of energy and capability. Candidates should have good contacts throughout the area and must be car owners. Applications, which will be treated in confidence, should be made in detail to the Sales Manager, M.K. Electric Limited, Wakefield Street, London, N.18. (R 158)

RESEARCH ENGINEER required by Cooke and Ferguson Ltd., Manchester, for interesting and responsible work. Applicants should be 23 to 30 years of age and of H.N.C. or degree standard. Experience of materials testing and processing, or thermal and di-electric phenomena, particularly relating to switchgear, will be an advantage. —Please reply, stating full information and salary required, to Personnel Manager, Cooke and Ferguson Ltd., Openshaw, Manchester 11. (R 93)

SENIOR CONTRACTS DRAUGHTSMAN with Higher National Certificate in Electrical Engineering required by switchgear manufacturers in the Manchester district. Able to work with the minimum of supervision on all types of switchboards up to 11 kV. Excellent opportunity for the right man. Salary commensurate with ability. Pension scheme available.—Reply, giving full details of experience, technical qualifications and age, to Box No. 1465, Electrical Times. (R 57)

TECHNICAL ASSISTANT. A large light electrical engineering company in the West London area require a Technical Assistant for their engineering laboratory. Applicants should have a good working knowledge of domestic electrical and mechanical appliances, including radio, television and industrial electronics. Minimum qualification: Higher National Certificate (Electrical). Special knowledge of electronics an advantage. Good conditions and pay.—Write, giving details of age, qualifications and experience, to Box No. 1483, Electrical Times. (R 118)

TRANSFORMERS AND WELDERS, LTD., Sandown Road, Watford, have vacancies for DRAUGHTSMEN accustomed to design of all types of transformers up to 10,000 kVA.—State experience, age and salary expected. (P 104)

WAREHOUSE COUNTER HAND required for Wholesaler House, Croydon Area.—Write stating experience, Box No. 1491, Electrical Times. (R 152)

## APPOINTMENTS WANTED

ELECTRICIAN (Scotch), with theoretical knowledge, keen on Colonial development, desires a position in British East Africa. Varied practical experience, chiefly in mine work. Sound references.—Box No. 1461, Electrical Times. (R 48)

## WORK WANTED

A.C. and d.c. Motor Rewinds and Repairs. Prompt service, fully guaranteed. Edgware 8631 (4 lines). —Service Electric Co., Ltd., Stanmore, Middx. (D 324)

CASTINGS. Fisher Foundries Ltd., Greet, Birmingham, have capacity for brass, gun metal and soft grey iron machine moulded repetition castings weighing 1-30 lb. Loose pattern work up to 3 cwt. Delivery by road to all parts. Tel.: B'ham, Victoria 0197. (P 570)

METALWORK. All types cabinets, chassis, racks, etc., to your own specifications.—Philpott's Metalworks Ltd., Chapman Street, Loughborough. (P 695)

## WANTED

A 450-500 kVA ALTERNATOR AND EXCITER, 400/3/50 V, 4 wire, at 375 r.p.m. A machine suitable for rewinding or conversion will also be considered.—Lewis Electric Motors, Moor Works, Maidenhead 2388. (R 160)

A.C./D.C. MOTORS, STARTERS, complete change over installations, etc.—A.A. Electrical Co., Ltd. 67 Rothschild Road, Chiswick Park, W.4. Tel.: Chiswick 5105. (A 20)

**£50,000**

Immediate cash available for purchase of New Ball and Roller Bearings, all types, Steel Balls and Rollers. Top prices Paid, small quantities accepted.

**CLAUDE RYE LTD.,**
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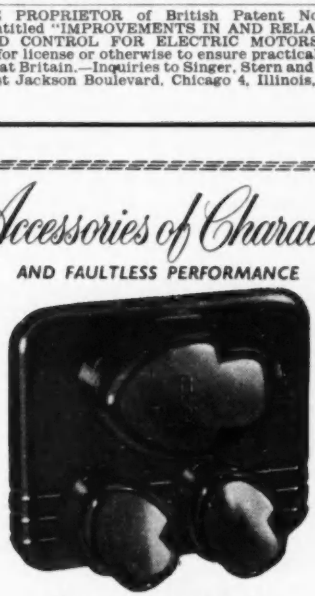

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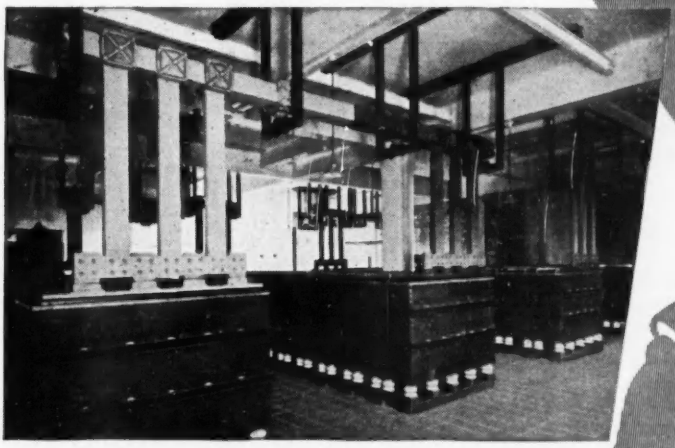

These batteries in the Museum Telephone Exchange, London, are typical of many P & G batteries installed throughout the country to maintain telephone efficiency. Our 60 years' experience in the battery business covers a vast and varied field; including batteries for generating stations, railway electrification work and emergency lighting systems. P & G 3 point service working on the sound principle of two heads being better than one, exists to provide: 1. *Detailed specifications or an impartial second opinion on any scheme.* 2. *Complete equipment and installation.* 3. *Regular inspection and report.*

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*Batteries for Switch Closing, Switch Tripping, Emergency Lighting, Supervisory Control Telephones, Supply to Auxiliaries*

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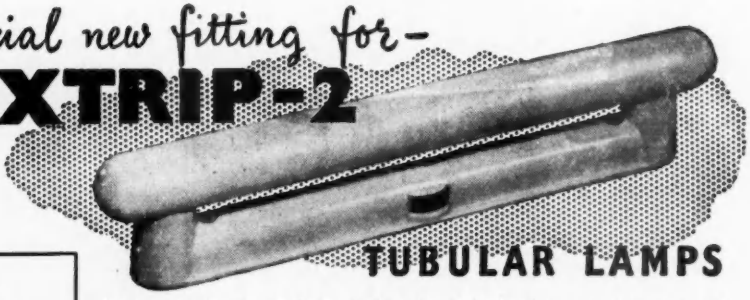
**MAXTRIP-2**



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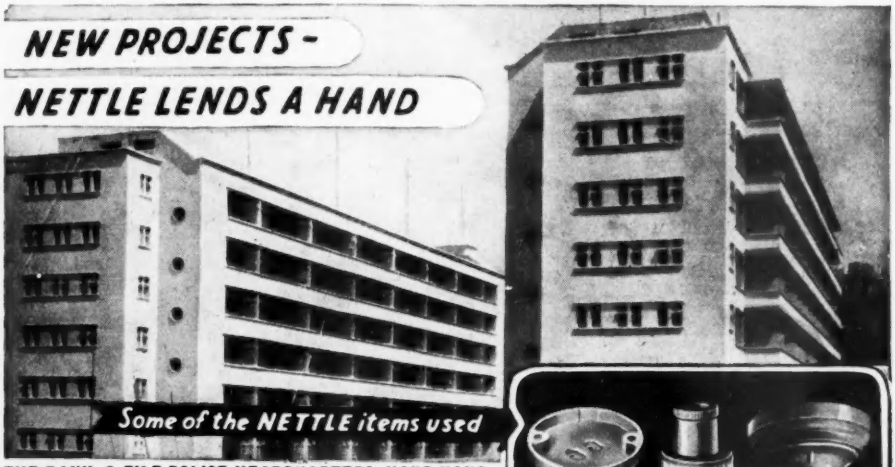
*NETTLE LENDS A HAND*



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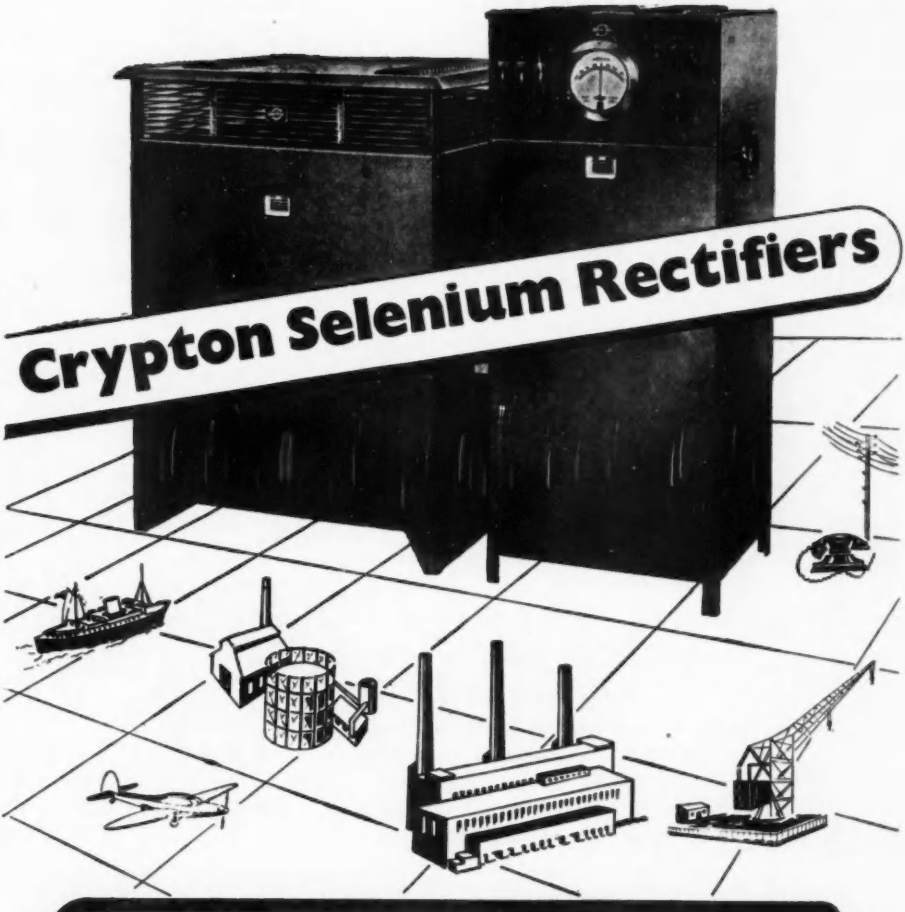


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# RECORD INSTALLATION

*of new generating plant, but*

# ELECTRICITY

*is still in short supply*

THE AMOUNT of new electricity generating plant commissioned annually has increased progressively during the past four years. In 1947 340 MW s.o. were commissioned. In 1948 the figure was 566 MW s.o., in 1949, 703 MW s.o. and in 1950, 965 MW s.o. Substantial though the post-war increase in generating capacity has been, it is not yet enough to make good the power shortage at times of Peak because of the continually rising demand. The usual peak hours are, Mondays to Fridays, 8 to 12 noon and 4 to 5.30 p.m., and during hours announced by the B.B.C.

Still more electricity is needed for rearmament and for home and export production. It can be supplied, despite the plant shortage, by existing power stations — *if* . . . The " if " is if too many users do not switch on at the same time. When they do, and " Peak " demands become too great, power cuts are unavoidable.

To help stop power cuts, domestic users, shops, hotels and offices are urged to keep their electric fires switched off and to cut down their demand in every possible way during Peak Hours. This will mean some sacrifice, but it will help keep the factories going.

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**NO WASTE**

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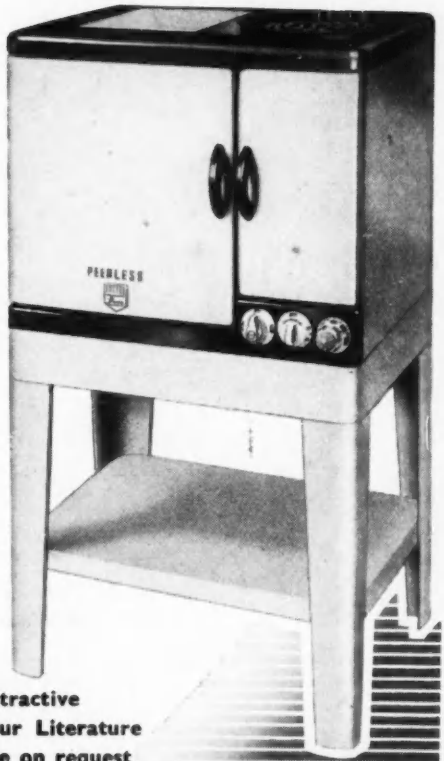

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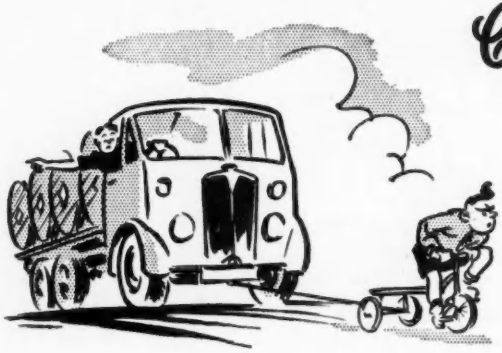

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**Many 'Plus' points including—**

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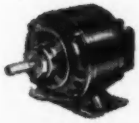

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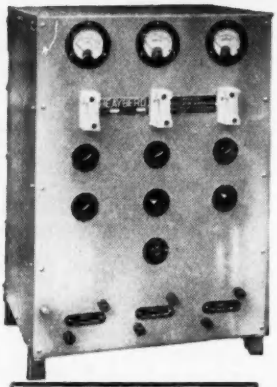

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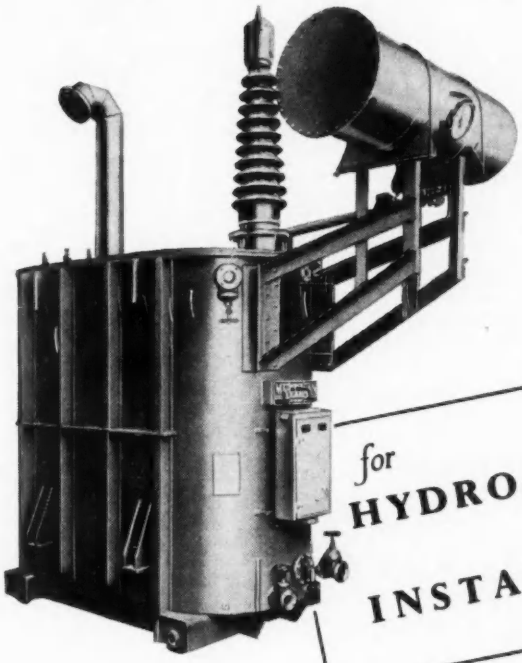
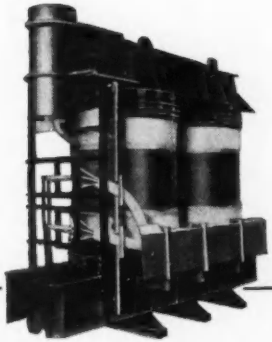


*for* HYDRO-ELECTRIC INSTALLATIONS

Metrovick have been supplying large transformers for hydro-electric installations for many years, and a recent important installation was for 9 single phase transformers to form three 30 MVA 3 phase Groups — ratio 11/165 kV. The top photograph shows the transformer in its tank. The lower illustration shows the core and windings.



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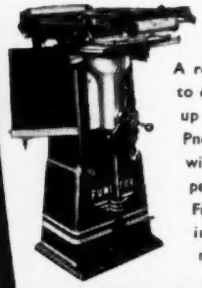

**Model 120**
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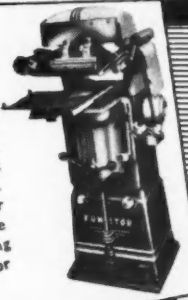

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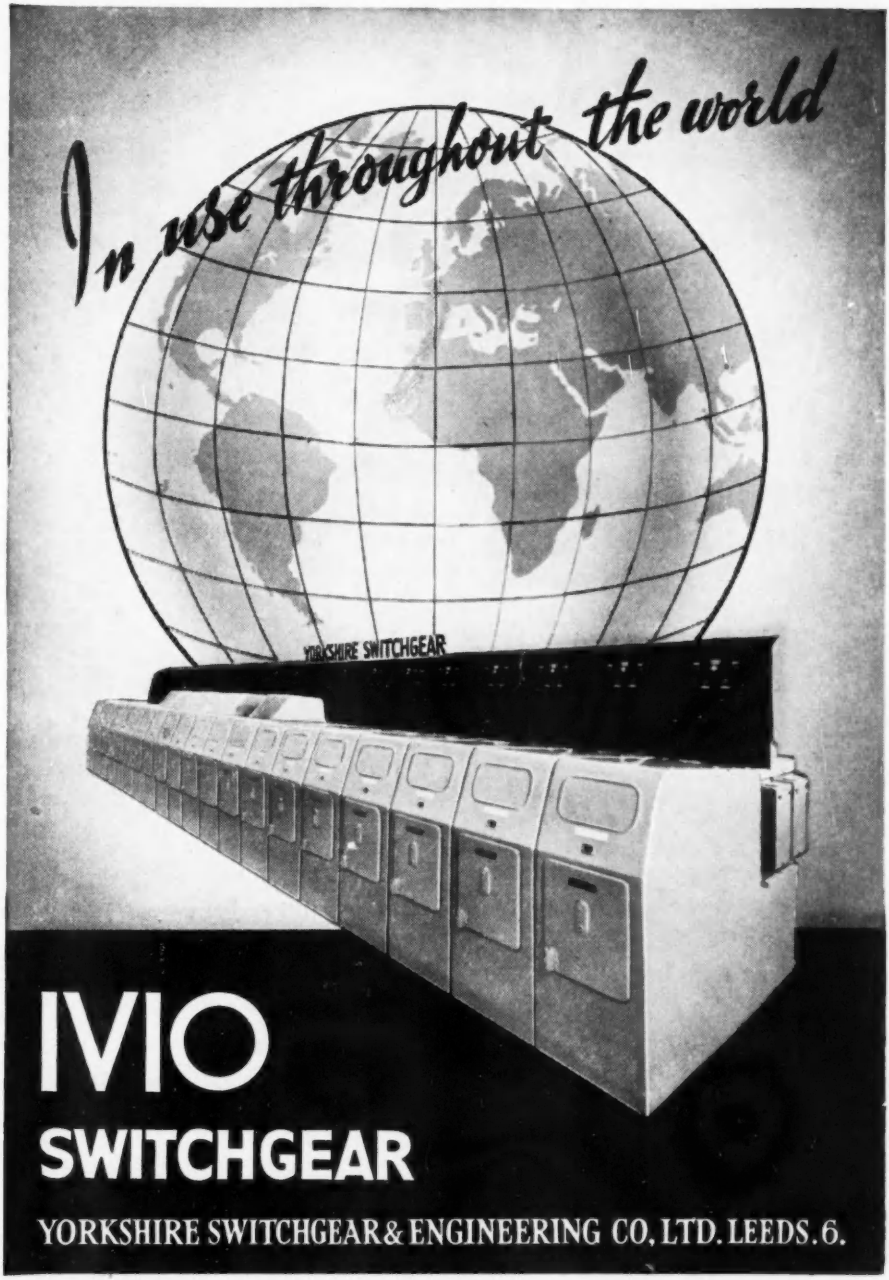


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# TRANS-WORLD QUIZ

✷

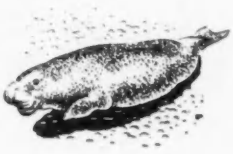
**Where** would you be in the native company of a 'teddy-bear' a dingo, a wombat, a platypus and a dugong?

**What**

is the smallest continent and the largest island in the world?

**Where**

does a man with a wife and child pay only £5 income tax on £400 p.a.?



THE answer to all three questions is—Australia. They are very good friends of Great Britain are the Australians. They send us more than £200,000,000 worth of food and wool each year to help us eat and keep warm. And they buy more than £250,000 000 worth of our exports. Part of those exports are thousands of the world-famous Parnall Electric Cookers and Washing Machines. Which is one reason why, for the time being, we cannot meet the Home Market's demands.

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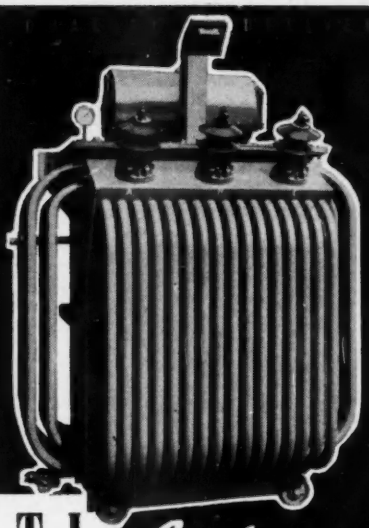

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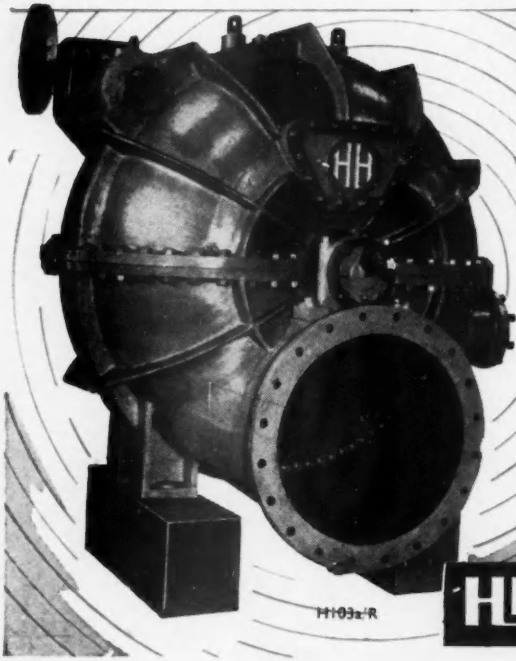


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